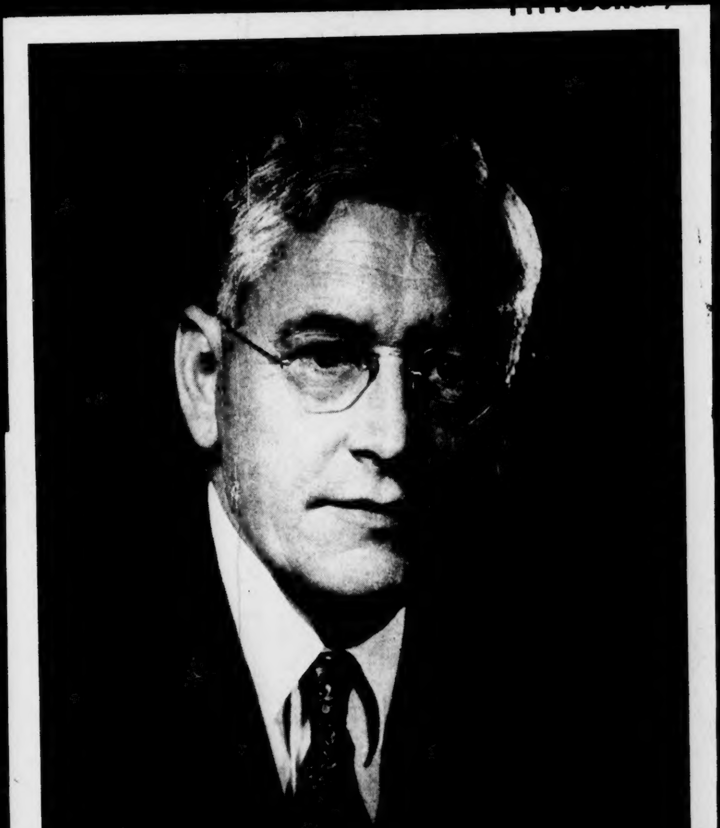
Metals Review



Metals Review
The News Digest Magazine

December 1957
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Important Lectures

Departments

ASM Review of Metal Literature

John Chipman—Past President A.S.M. Presented Gold Medal Award—1957

IF ANY ONE MAN CAN BE SAID TO personify the field of metallurgy, that individual is John Chipman. Not only through gifted teaching and inspired research, but through wise professional leadership, he has helped lift metallurgy to a highly respected plane of science and engineering, wherein metallurgists can discharge their obligations to society and nation with satisfaction, noteworthy effect, and due reward. At a time when it was popular to accentuate the many intriguing facets of metallurgy, John Chipman expounded the unity of metallurgy; in curriculum, in publications, and in action, he has striven to bridge the gap that tends to separate physical and process metallurgy, theory and practice, science and engineering.

In particular, Dr. Chipman has been a pioneer in the application of physico-chemical principles to the production and refining of metals. He might be called "the father of metallurgical thermodynamics". His fundamental papers on slag control, oxidation and deoxidation, sulphur reactions, gas-metal equilibria, and high-temperature chemistry have done much to initiate similar research in other laboratories, and have provided industry with a quantitative approach to many aspects of metallurgy. This basic viewpoint is being carried forward by Dr. Chipman's associates and evergrowing ranks of students; it is now reflected in the teaching and practice of metallurgy in all parts of the world.

Notwithstanding these varied pursuits, Dr. Chipman has devoted much time to government and professional activities. During World War II, he was Chief of the Metallurgy Section of the Manhattan District Project at the University of Chicago where the first nuclear reactor was placed in operation. He later became director of the corresponding metallurgical project at M.I.T. As president and trustee of the American Society for Metals, he participated vigorously in the establishment of the A.S.M. Foundation of Education and Research, which has since contributed on a broad front to enhance the stature of metallurgy and to attract students into the field.

One could dwell at length upon the impressive list of honors and medals that have been bestowed upon Dr. Chipman in this country, England, Sweden and Italy. But perhaps the greatest tribute to his vision and attainments is the M.I.T. department of metallurgy which he has led for the past 11 years. This lively group has grown to a faculty of 27 members, a student enrollment of 100 undergraduates and 130 graduates, and a publication rate of about 70 papers per year. The range of activity covers almost every aspect of metallurgy, from mineral engineering to metal physics, and reflects the eminent position that John Chipman has conceived for metallurgy.

In recognition of his leadership, the American Society for Metals is proud to confer upon Dr. Chipman its 1957 Gold Medal.

A. S. M. METALLOGRAPHIC EXHIBIT—1957

Best in Show
Francis F. Lucas Award
T. K. Bierlein and B. Mastel
Hanford Laboratories Operation
General Electric Co.
Richland, Wash.
"Electron Micros of Zircaloy-2"

Class 1A—Carbon and Alloy Steels

Best in Class: S. R. Rouze, W. L. Grube and T. R. McKinney, Physics-Instrumentation Dept., General Motors Corp., Detroit, Mich.—Carbonitrided S.A.E. 1132 Steel.

Honorable Mention: C. Crussard, G. Henry and J. Plateau, Institut de Recherches de la Siderurgie Saint Germain en Laye, France—Cleavage Rupture Surface of Mild Steel Broken at − 196° C.

Class 1B—Cast Irons

Best in Class: Metallographic Laboratory, Foundry Research Institute, Brno, Czechoslovakia—Cast Iron—Steadite, Graphite, Manganese Sulphide, Pearlite.

Honorable Mention: James R. Dvorak, Metallographer, Armour Research Foundation, Chicago, Ill.—Chill Cast Gray Iron.

Honorable Mention: R. D. Buchheit, A. D. Friday and L. Dillinger, Battelle Memorial Institute, Columbus, Ohio—Cast Iron Structures—Low-Alloy White Iron; Gray Iron; Ferritic Iron.

Class 1C—Special Irons

Best in Class: Alex E. Wituszynski, General Electric Co., Research Laboratory, Schenectady, N. Y.—Decomposition Products of Cementite and Austenite in Iron Saturated With Carbon.

Honorable Mention: L. Dillinger and R. Monroe, Battelle Memorial Institute Columbus, Ohio—Sulphurized Armco Iron.

Class 2—Stainless Steels and Heat Resisting Alloys

Best in Class: Robert E. Smith, General Electric Co., Schenectady, N. Y.—Electron Micro of Co-Ni Base Superalloy Revealing Plate Precipitation.

Honorable Mention: P. S. Trozzo, U. S. Steel Corp., Applied Research Laboratory, Monroeville, Pa.—Electron Micro of $(Fe,Cr)_{23}C_6$ Precipitate at Grain Boundary of 304L Stainless.

Honorable Mention: Francis E. Bates, Materials and Processes Laboratory, General Electric Co., Lynn, Mass.—Deformation Bands in Cold Worked Austenitic Steel.

Class 3 — Aluminum, Magnesium, Beryllium, Titanium and Their Alloys

Best in Class: B. Jaoul and I. Bricot, Centre de Recherches de l'Ecole des Mines, Paris, France—Symmetrical Slip Bands on Both Sides of a Grain Boundary in Pure Aluminum.

Honorable Mention: R. D. Buchheit and G. A. Wheeler, Battelle Memorial Institute, Columbus, Ohio—Twinning in Ti-6Al-4V Plus 400 Ppm. H_2, Solution Heat Treated and Aged.

Honorable Mention: J. A. Coles and R. Slepian, Electron Microscope Laboratory, Westinghouse Electric Corp., East Pittsburgh, Pa.—Electron Micro of Ti-8% Mn Alloy Deeply Etched to Reveal Sub-Grain Structures.

Class 4—Copper, Nickel, Zinc, Lead and Their Alloys

Best in Class: L. E. Samuels, Defence Standards Laboratories, Alex-

Metallographic Awards
Continued

andria, N.S.W., Australia—Deformation Twins and Kink Bands in Compressed Polycrystalline Zn.

Honorable Mention: Anna M. Turkalo, General Electric Co., Research Laboratory, Schenectady, N. Y.—Fracture Surface (15,000X) of Ni-Al Alloy.

Honorable Mention: Duane E. Broecker, General Electric Co., Research Laboratory, Schenectady, N. Y.—Molybdenum-Rich Skeletons, Nickel Dendrites and Ni-Ni_3Al Eutectic in an Ni-Al-Mo Alloy.

Class 5—Uranium, Plutonium, Thorium, Zirconium and Reactor Fuel and Control Elements

Best in Class: T. K. Bierlein and B. Mastel, Hanford Atomic Energy Operation, General Electric Co., Richland, Wash.—Electron Micros of Zircaloy-2. (See also Best in Show)

Honorable Mention: Jack J. Bodzin, Detroit Edison Co., Engineering Laboratory and Research Dept., Detroit, Mich.—Swirls in Swaged U-10% Mo Fuel Elements.

Class 6—Metals and Alloys Not Otherwise Classified

Best in Class: Charles F. Tufts, Electron Microscopist, Ruth Smith, Senior Technician, William J. Feminella, Photographic Enlargement, Sylvania Electric Products, Inc., Research Laboratories, Bayside, N. Y.—Electron Micro of Undoped Tungsten Wire After Annealing.

Honorable Mention: R. D. Buchheit, G. A. Wheeler and C. T. Sims, Battelle Memorial Institute, Columbus, Ohio—Deformation Lines in an Mo 35 At.% Re Alloy.

Honorable Mention: I. Greenfield, Franklin Institute, Philadelphia, Pa.—Electron Micro of Thermally Etched Silver.

Honorable Mention: Anna M. Turkalo, General Electric Co., Research Laboratory, Schenectady, N. Y.—Lithium Fluoride — Neutron Irradiated.

Class 7—Series Showing Transitions or Changes During Processing

Best in Class: Domenic J. Molella, Metallurgist, Picatinny Arsenal, Dover, N. J.—Commercially Pure Copper — Electroformed Cone Made by Electrodeposition on a Plastic Shell Cone.

Honorable Mention: Clarence R. Lehmann and Vincent M. Poynter, Aircraft Gas Turbine Div., General Electric Co., Cincinnati, Ohio—Microstructural Changes in Welding of 0.5% Ti-Mo Alloy.

Class 8—Welds and Other Joining Methods

Honorable Mention: Victor Merritt, Core Engineering Dept., Bettis Atomic Power Div., Westinghouse Electric Corp., Pittsburgh, Pa.—Hafnium-Zircaloy-2 Weld.

Honorable Mention: Henry V. Konjevich, Metallographer, Armour Research Foundation, Chicago, Ill.—Ti-V Steel Roll Bonded, Clad 1000° C., 2 Hr.

Honorable Mention: Mlle. A. J. Tabary, Engineer and Head of Laboratory, Compagnie de Fives-Lille, Lille, France—Weld in Heat Resisting Steel EN 25-20.

Class 9—Surface Coatings and Surface Phenomena

Best in Class: Alex E. Wituszynski, General Electric Co., Research Laboratory, Schenectady, N. Y.—Surface Effects Produced on Iron + 3% Si After Annealing at 1230° C. in Argon.

Honorable Mention: T. Copan and E. Gulbransen, Westinghouse Research Laboratories, Pittsburgh, Pa.—Low-Pressure Oxidation of a Pure Iron Surface.

Class 10—Results by Unconventional Techniques

Best in Class: Maurice M. Dumais, M.I.T. Lincoln Laboratory, Lexington, Mass.—Twinned Structure in Ge.

Honorable Mention: Andre Vinckier, Westinghouse Research Laboratories, Churchill Borough, Pittsburgh, Pa.—Plastic Compression of Steel Ring With a Hole.

Class 11—Slags, Inclusions, Refractories, Cermets and Aggregates

Best in Class: A. D. Friday, Battelle Memorial Institute, Columbus, Ohio—Effect of High-Velocity, High-Temperature Gas on Aluminous Refractory Materials.

Honorable Mention: Ralph A. Attivo, Metallographer, Standard Steel Works Div., Burnham, Pa.—Slag Inclusion in Forged Disk of S.A.E. 4140 Steel.

Honorable Mention: Alexander McMaster, General Electric Co., Research Laboratory, Schenectady, N. Y.—Arc Cast and Annealed Oxide of Ti and Al.

Class 12—Color Prints

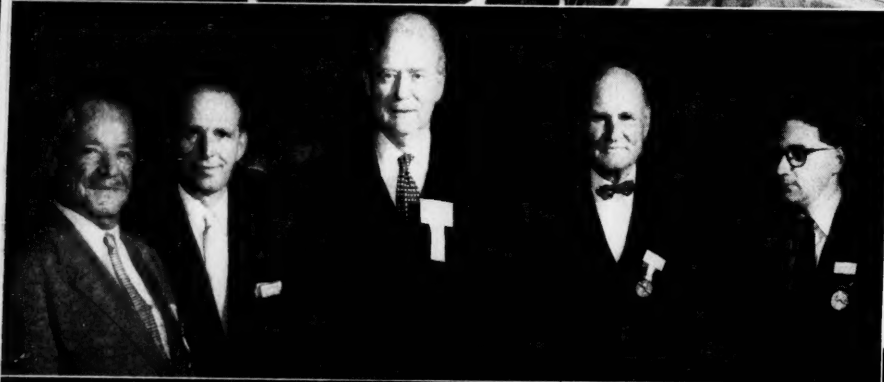
Best in Class: C. K. H. Dubose and R. J. Gray, Oak Ridge National Laboratory, Union Carbide Nuclear Co., Metallurgy Div., Oak Ridge, Tenn.—Uranium-Carbon Alloy, Chemically Anodized.

Honorable Mention: J. Moreau and J. Benard, Institut de Recherches de la Siderurgie Saint Germain en Laye, France—5% Cr-Ni Alloy—Interferential Oxide Film Produced by Heating.

Honorable Mention: Research Institute for Materials and Technology, Prague, Czechoslovakia — Nitrided Case of 0.35% C, 1.5% Cr, 1.2% Al Steel.

Scenes From the Congresses—see p. 6-7

Left, From Top: T. O. Westhafer, Alfred Lassia, Northwestern Student, and Past Trustee Norman Tisdale, Chat During Distinguished Service Luncheon; Max Hansen, Deutsche Gesellschaft fur Metallkunde, Charles M. White, Republic Steel Corp., and Zay Jeffries, director general W.M.C., at the Welcome to America Luncheon in New York; W. H. Eisenman, Otto Schaaber, Bremen, Germany, E. E. Thum, editor, Metal Progress, Dr. Jeffries and R. A. Skinner, John Thompson Nuclear Energy Co., Ltd., England, at the First Plenary Session, W.M.C.; University of Wisconsin students with trustee E. E. Stansbury at Distinguished Service Luncheon; and G. M. Young, president A.S.M., reviews Metal Progress covers at the A.S.M. Booth. Center, left, top: Then President Donald S. Clark and past president A. O. Schaefer at presentation of Sauveur Achievement Award to Tokushichi Mishima at Annual Banquet. Center, left, bottom: Drs. Clark and Jeffries at Farewell to America Banquet. Center, right, top: Drs. Jeffries and Clark with past president John Chipman, who received the Gold Medal, at the Annual Banquet. Center, right, bottom: Overseas guests pow-wow with Indian dancer at the Wild West Show given by Mr. Eisenman in Cleveland. Right, from top: Francis Lucas presents the Lucas Metallographic Award to T. K. Bierlein; Mr. White opens the 2nd W.M.C. in New York, while I. W. Wilson, Aluminum Co. of America, and Dr. Clark look on; a very busy Metal Powder Association booth; scene during the Exposition shows heavy traffic; Japanese conferees with Secretary Eisenman at the Wild West banquet held in Cleveland for overseas conferees



NATIONAL CONGRESS AND 2nd METALLURGICAL

Seen Here and There

(See Identification p. 5)

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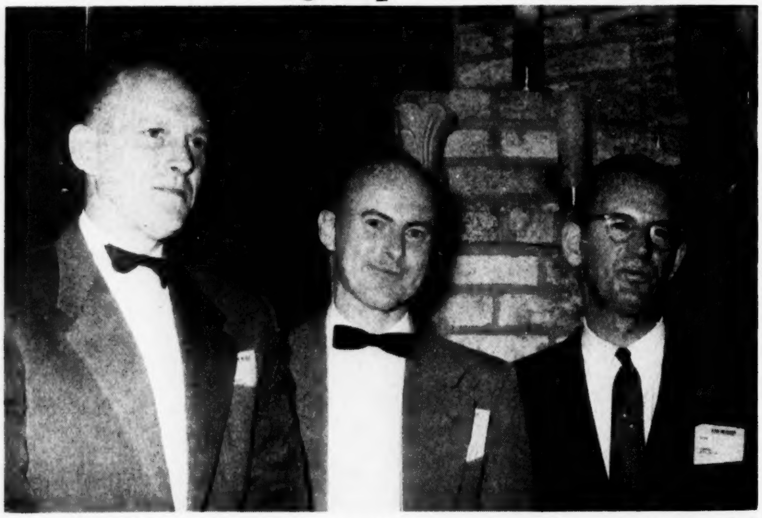
METAL EXPOSITION WORLD CONGRESS

Highlights of Congress Activities

Vacuum Melting Topic at Santa Clara



E. G. Vogt, Universal-Cyclops Steel Corp., Presented a Talk Entitled "Vacuum Melting: What It is—What It Does" at a Meeting Held by Santa Clara Valley Chapter. Shown are, from left: Perry Slocum, program chairman; Dr. Vogt; and R. Parkman, chairman. (Photo by J. Anderson)

Speaker: E. G. Vogt
Universal-Cyclops Steel Corp.

E. G. Vogt of the research and development department, Universal-Cyclops Steel Corp., presented a talk entitled "Vacuum Melting: What It Is—What It Does" at a meeting of the **Santa Clara Valley Chapter.**

Vacuum melting is used to prevent contamination of metals during melting or to remove impurities. The two most common commercial practices are induction melting and consumable electrode arc melting. Vacuum induction melting eliminates contamination of the melt by the atmosphere or slag, and in some cases removes gaseous or volatile impurities. Vacuum arc melting in a cooled crucible likewise accomplishes this and also avoids contamination from the crucible. Another commercial process, somewhat related to vacuum melting, is the Bochumer-Verein method of vacuum degassing in which a ladle of molten metal is tapped into an evacuated mold chamber.

Many reactive metals, such as titanium, zirconium and molybdenum, can be melted only in vacuum or under a high-purity inert atmosphere. Other materials, such as high-temperature alloys, alloy steels, and even low-carbon steel, show improved properties when melted in vacuum. High-temperature alloys show increased strength and greatly increased ductility at high temperatures as a result of vacuum melting. This is reflected in the continual tightening of specifications for Waspaloy over the last few years. This appears to result from a smaller amount of nickel-oxygen eutectic at the grain boundaries of vacuum melted alloy. Bearing steels show improved fatigue and impact properties, presumably due to the elimination of certain types of inclusions.

The removal of gaseous impurities from metals during vacuum melting is based on fundamental physical chemistry. Nitrogen and hydrogen generally obey Sievert's Law relating solubility to the square root of pressure. Oxygen usually does not obey this law due to solubilities of oxides and would require unreasonably low pressures to be pumped off as oxygen gas. Many oxides, however, are easily reducible by carbon, and the product, principally carbon monoxide, can be pumped off at operating pressures.

Mr. Vogt described current commercial practices and facilities, including Universal-Cyclops' Inductovac and Duovac processes and their new vacuum arc melting facility for ingots of 24-in. diameter and larger. He also discussed their inert atmosphere room, now under construction, for the fabrication of molybdenum and other reactive materials.—**Reported by E. S. Wright for Santa Clara Valley Chapter.**

—Metals Are Vital to Every Industry—

Holds Quench & Draw Party

The **Washington Chapter** inaugurated its 1957-58 season with its annual "Quench and Draw Party" which was held at the Knights of Columbus Club. The meeting, entirely social in nature, was attended by a capacity crowd and was considered an unqualified success.—**Reported by R. M. Gustafson for Washington Chapter.**

Gives History of Glass Ceramics at Wilmington

Speaker: A. H. Callander
Corning Glass Works

Alexander H. Callander, sales development coordinator, industrial section, new products division, Corning Glass Works, presented a talk entitled "Pyroceram—the Evolution of Glass Ceramics" at a meeting of the **Wilmington Chapter.**

Mr. Callander outlined briefly the history of glass and showed that much of the progress that has been made in the field has been made in the last half century.

Mr. Callander described Pyroceram as a crystalline material that is formed from a noncrystalline glass. This glass may contain one or more nucleating agents. The glass is melted, formed and cooled in an ordinary way. Then the formed product undergoes a series of heat treatments that cause the nucleating agents to make the glass crystalline in structure. The end product is a nonporous fine-grained material that is harder than many metals.

Pyroceram has many unique properties which can be controlled at will by the changing of the formula from which the Pyroceram is made. The coefficients of expansion for the types of Pyroceram made range from slightly negative to about 200 x 10^{-7} per degree C obtained on an experimental Pyroceram formula. It has a thermal shock resistance that is equivalent to fused silica. Pyroceram has been found to be harder than flint, high-carbon steel with a 65 Rockwell C, but not quite as hard as a sapphire. There is little loss of strength up to about 700° C. and it will remain rigid to about 1300° C. where it will begin to soften.

As to exact uses for the new material, it is believed to have applications in such fields as nose cones in rockets, as piping where it is highly corrosion resistant, or in ball and roller bearings. These are but a few of the many end uses to which this new product may be applicable.

Mr. Callander illustrated his talk by showing two colored films illustrating various facets of the glass industry, also demonstrating some of the properties that are inherent in Pyroceram.

An informal question and answer period followed the talk in which Mr. Callander explained to those interested some of the more involved technical aspects of the new material. —**Report by Liston Noble for Wilmington Chapter.**

A.S.M. spends $44.50 to service each member of the Society for a period of one year.

Precision Grinding and Boring Topics at Meeting Of Worcester-Springfield

Speaker: Wayne H. Folger, Jr.
Heald Machine Co.

Wayne H. Folger, Jr., supervisor of machine sales, The Heald Machine Co., lectured on "Precision Boring and Grinding" at the annual joint meeting and plant trip of the **Worcester** and **Springfield Chapters** which was held at The Heald Machine Co.

Mr. Folger's talk covered the broad subject of machine tools, their place in the economy and the general history and significant contributions of Heald. Several representative applications were also discussed. A generous use of slides helped to illustrate the information discussed by the speaker.

The influence of machine tools on our daily way of living is significant in the fact that we would not be able to enjoy our high standards of today without mass production. Regardless of the nature of the industry, whether it be automobiles, furniture, railroads, farm equipment or aircraft, the machine tool is the starting point. It is through this medium that the manufacturer is able to make his product at a reasonable price and profit. This is true in the peacetime industries as well as in the country's defense setup.

The machine tool industry, for all its importance and impact, is still a small segment of the American industrial system. Even in peak periods the total employment seldom exceeds 60,000 and this is comprised of 300 companies, with an average machine tool builder employing 200 to 250 people. The industry is divided into two main groups—the metal forming and the metal cutting.

The machine tools are placed in groups identified as the six basic arts of shaping metal, which are drilling and boring, turning, milling, planing, grinding and forming.

The speaker traced the history of The Heald Machine Co. from its founding in 1826 to the present-day plant. Illustrations of the various plants occupied and products manufactured were shown to show the progress made over the years.

The remainder of the lecture was confined to specific machinery as made by Heald and applications of these machines to customer problems. Circular surface grinding of high-carbon steel spacers 0.009 in. thick to tolerances of 0.0001, forged piston carriers to 8 micro-in. finish, and planetary gear faces to control exact lengths were a few examples of surface grinder applications. The internal grinding machines shown were of the older cylinder bore grinding type as well as the internal centerless machines developed for the high production ball bearing manufacturers.

The advent of the boring machine due to the need for precision finishing of cast irons and nonferrous metals and the perfection of suitable cemented tungsten carbide tools gave the real impetus to the boring machine field. The use was widespread, covering many operations such as boring, grooving, chamfering and facing on different materials ranging from steel to uranium. The boring machine lends itself well to integrated automation lines or transfer machines and is used extensively in the automotive industry.

In conclusion, Mr. Folger mentioned the challenge faced by the machine tool manufacturer because of the rapid population growth and the myriad of products that will be necessary to satisfy this increased market.—**Reported by Paul J. Lisk for Worcester.**

Speaks on Aluminum Die Castings

Members of the Fort Wayne Chapter Heard a Talk on "Aluminum Die Casting" at a Recent Meeting. Shown are, from left: Donald L. Colwell, vice-president for laboratory research, Apex Smelting Co., and Carl Bobay

Speaker: Donald L. Colwell
Apex Smelting Co.

Members of the **Fort Wayne Chapter** heard Donald L. Colwell, vice-president for laboratory research, Apex Smelting Co., speak on "Aluminum Die Castings".

Mr. Colwell stated that die casting is still more of an art than a science, but that more science is needed. The growth in the use of aluminum for die casting has been striking and is expected to be about 200,000 tons this year.

There are about ten aluminum-base alloys offered for die casting and most have very limited application. Of the ten, many are variations of a few. The silicon alloys combine excellent castability with good corrosion resistance while the alloys with magnesium, zinc and copper additions provide better machinability.

Data on the aging and corrosion effects on various alloys as found and reported by the ASTM were presented. Briefly, such tests showed that zinc had no effect on the corrosion resistance or mechanical properties of Cu-Si alloys and that commercial purity alloys are just as satisfactory as high-purity alloys from a corrosion standpoint.

Mr. Colwell discussed die casting troubles and solutions at some length. Highlights of this were the effect and control of porosity and hard spots. It was pointed out that porosity is detrimental to the production of pressure-tight parts and to machinability. If dies are gated and vented properly, if excess oil lubricant is kept out of them, and if alloys with controlled manganese and iron contents are used, then porosity can be minimized. Vacuum die casting may have possibilities along this line.

The problem of sticking can best be dealt with by selection of melters' alloy and coating of dies. Die coatings mentioned were salt bath tempered, steam tempered and boron-nitride sprayed.

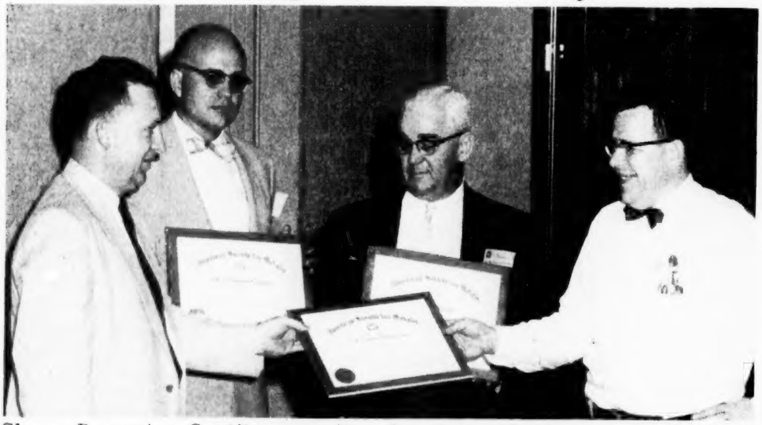
Hard spots are a result of oxides, or more often of sludge in the castings. The control of sludge is possible by adding only molten metal to the holding pot and not ingots, thus preventing local freezing of the heavy elements. Agitation helps prevent sludging at the pouring temperature and at the same time prevents segregation if the metal is kept uniformly above the liquidus temperature.

Closing remarks concerned die materials and zinc-base die casting alloys.—**Reported by N. L. McClymonds for Fort Wayne.**

Outlines Uses of Atomic Energy

Calvin T. Hughes, Vice-President and Consulting Engineer, Connecticut Light & Power Co., Presented a Talk on "Peacetime Uses of Atomic Energy" After Members of the New Haven Chapter Toured the Facilities of His Company's Plant. Mr. Hughes is shown (center) with Arthur F. Simpson, technical chairman of the meeting (left), and Harold O. Seeley, chairman

Get Sustaining Members Certificates



Shown Presenting Certificates to New Sustaining Members of the Carolinas Chapter Is the Retiring Membership Chairman V. J. Vierling. Accepting certificates are, from left: Tom Tucker, A. B. Crawford Co.; J. L. Highsmith, J. L. Highsmith Co.; and Solon Schwoyer, personal sustaining

Ladies Night Features Organ Music

A Group of Members of the Peoria Chapter Joined Their Wives to Watch an Organ Demonstration by Charles Adams, Ozzie Osborne and Harvey Muncie of the Adams Music Co., at the Ladies Night Program Held Recently. The subject for the evening was "Entertaining With the Hammond Organ"

Men of Metal

C. E. FORD has been named to the newly created position of new products marketing manager by National Carbon Co., and will be responsible for developing industrial markets for the products coming out of research and development.

GEORGE E. DRAKE, former assistant general manager, Silicones Division, is now vice-president in charge of sales, Electro Metallurgical Co.

STANLEY J. MILLER has been appointed assistant director of the plant engineering division of Joseph T. Ryerson & Son, Inc., with headquarters in the general offices in Chicago.

The National Bearing Division of American Brake Shoe Co. has appointed ALBERT L. HUNT vice-president in charge of manufacturing operations in St. Louis, Mo., Meadville, Pa., and Chicago, Ill. PAUL J. BAUMAN, now vice-president in charge of industrial sales of the entire division, will continue to be located in Pittsburgh.

The Industrial Diamond Association of America has elected W. L. HUBER, manager of Diamond Tool Research Co., as president, MORRIS WINSTON, with Diamond Drill Carbon Co., first vice-president, and DON WALLACE of Wheel Trueing Tool Co., second vice-president.

J. M. GAINES moves from director of research to associate technical director of Linde Co. to supervise technological developments in process metallurgy and related fields.

JAMES A. KRUMHANSL, formerly assistant director, has been named associate director of the Parma Research Laboratories of National Carbon Co.

Washington Steel Corp., announces that J. M. HANING has been promoted to manager of home office sales and HOWARD H. HILDRETH to manager of strip sales.

JOHN MILOS, vice-president in charge of operations, Phoenix Iron and Steel Co., has been elected to the board of directors, and as vice-president and director of the Phoenix Bridge Co.

R. H. ROBINSON has been appointed sales engineer and manager of the Buffalo district office by General Alloys Co.

R. B. McCarthy, assistant chief engineer since January of this year, has been promoted to chief engineer, Steel Mill Division of Surface Combustion Corp.

W. H. Dailey, Jr., has been appointed sales manager of the new pelletizing division, Surface Combustion Corp. Until his new appointment he was chief engineer of the Steel Mill Division.

MEN OF METAL

A. K. Lang, with Lindberg Engineering Co. for more than 20 years, has been appointed general manager of the manufacturing plant in Downey, Calif. He will be responsible for sales activities of Lindberg Engineering Co. and Lindberg Industrial Corp. in Downey, San Francisco, Seattle and Denver, which offices cover the 11 western states.

Comco, Inc., division of Enthone, Inc., has appointed Avery Smith assistant to the general manager to assist in the preparation of proposals for plating room equipment and fulfill a liason function between customer's requirements and Comco facilities.

Robert Pittsley of Dow Chemical Co. has been promoted from magnesium salesman to magnesium sales supervisor in the Detroit office territory.

DOUGLAS O. YODER, president of the Yoder Co., has been elected a director of The Steel Improvement & Forge Co., Cleveland, Ohio.

As part of the current expansion and modernization program, HENRY A. ROEMER is turning over the management of Sharon Steel Corp. to a management group, but will continue as a director and chairman of the company's executive committee. JAMES A. ROEMER, president of Mallory-Sharon, was elected chairman of the group. ALFRED M. TREADWELL, JR., formerly vice-president in charge of operations, will be president, also a director and member of the executive committee. James Roemer continues as chief executive when the company becomes Mallory-Sharon Metals Corp. later this year.

HARRY S. SCHWEINSBERG, sales manager, Philadelphia district, has been appointed assistant general sales manager of Harbison-Walker Refractories Co., with headquarters at the home office in Pittsburgh.

RALPH REYNOLDS, formerly technical sales manager, is now general sales manager of Acoustica Associates, Mineola, L. I.

EDWARD F. KURZINSKI, a leading expert in the field of process metallurgy, has joined Air Products, Inc., as manager of sales development engineering, to assist ferrous and nonferrous industries with their problems relating to the use of oxygen and other industrial gases.

Surface Combustion Corp., announces the appointment of W. H. DAILEY, JR., as sales manager of their new Pelletizing Division. He was formerly chief engineer of the Steel Mill Division.

Rhode Islanders Tour Naval Station

The Rhode Island Chapter's Second Meeting of the Year Included a Tour Through the Newport Naval Training Station, Including the U. S. Underwater Ordinance Laboratories. After the tour, G. G. Gould, technical director of the Ordinance Section, Spoke on "Torpedo Research and Development". Shown, from left, are: William Matthew, chairman; Mr. Gould; and Carl Rex, past chairman. (Reported by W. Gordon Partington)

Talks on Sponge Iron and Steelmaking

C. R. Taylor, Supervising Metallurgist, Armco Steel Co., Presented a Talk Entitled "Sponge Iron and Steelmaking" at a Meeting Held Recently by the Kansas City Chapter. Shown, from left, are: Dr. Taylor; Dave Goldberg, chairman; and C. K. Kenyon, vice-chairman. (Report by W. H. Deterding)

Western Ontario Hears Talk on Forging

Forty Members and Guests of the Western Ontario Chapter Heard a Talk on "Forgings" Given by A. O. Schaefer, President, Pencoyd Steel and Forge Corp., and Past President A.S.M., at a Recent Meeting. Shown during the meeting are, from left: R. T. Waddington, technical chairman; Mr. Schaefer; R. Cyr, chairman; and B. Blair, past chairman. (Report by F. Miller)

Explains Structure of Earth Satellite

"Metallurgical Aspects of the Earth Satellite" Were Explained by Alexander Simkovich, Ensign, U.S.N., at a Meeting of the Penn State Chapter. Shown are, from left: George Simkovich, technical chairman; Glenn Bush, chairman; Amos Shaler, Penn State University; and Ensign Simkovich

Speaker: A. Simkovich
United States Navy

"Some Metallurgical Aspects of the Earth Satellite" was the subject of a talk by Alexander Simkovich, ensign, U.S.N., at a recent meeting of the **Penn State Chapter.** Ensign Simkovich is a member of the Satellite Structures Group, Project VANGUARD, at the U. S. Naval Research Laboratory in Washington, D. C.

After a brief introduction to the flight and orbital conditions imposed upon the satellite, the speaker discussed the selection of a material for its construction. Among the factors which had to be considered were fabrication characteristics, strength at room and elevated temperatures, availability, cost, density, and the amount of previous industrial experience in fabricating the metal. Magnesium, alloy AZ31B, was finally chosen as the constructional material due to its low density at maximum operating temperature.

The satellite proper consists of two hemispherical shells fastened to an inner support structure. The fabrication of the shells consists of several steps, the first of which is deep drawing. Here, a circular disk is heated and deep drawn in one stroke of a press into a hemisphere. After this operation, spinning is performed to attain the specified internal dimensions of the shells. A pressure section, which is also formed by spinning, is welded to each hemisphere, and the shells are then stress relieved and machined.

The inner supports are formed by bending ½ in. tubes to the desired shapes and welding them together to make a rigid structure. The welded structure is then stress relieved and machined. The final operation, before the assembly of the satellite, is the electroplating of the inner support structure and shells with layers of zinc, copper, silver and gold.

The electroplated layer of gold on the internal surfaces of the satellite serves to lessen the amount of radiation from the shell to the internal package. The three underlayers of zinc, copper and silver are used to achieve an adherent layer of gold.

After the satellite is assembled, its external surface is covered with vacuum deposited coatings of chromium, silicon monoxide, aluminum, and lastly, an outer layer of silicon monoxide. The chromium is used because of its excellent adherence to substrates. The first layer of silicon monoxide prevents diffusion of the chromium into the aluminum, which is applied to give the shell excellent reflectivity. The final coating of silicon monoxide controls the emissivity of the external surface.

A rigid test program is in effect throughout the fabrication of the satellite. This testing includes visual inspection, pressure tests and determination of the proper emissivity value of the shell coating. After the satellite is assembled and the instruments are installed, the satellite undergoes vibrational, accelerational and environmental testing. Dynamic balancing, which eliminates force couples and adjusts the center of gravity, finally prepares the satellite for launching.

The talk was concluded with a brief desecription of the various instruments contained within the satellite and their functions.—**Reported by Richard Heacox for Penn State.**

Washington Holds Series For High-School Students

The **Washington Chapter** recently completed a series of six lectures on metallurgy at Georgetown University. These talks were intended to show high-school students, metal workers and other interested people the world of metals—where they come from, their uses, their properties and how they are formed. The schedule of lectures included:

Metals From Stones: Discovery and mining of metals from aluminum to uranium, presented by Allen Lewis and John E. Shelton of the Bureau of Mines, Department of the Interior.

How Metals Other Than Iron Are Produced: Refining of copper and light metals, presented by Richard Schmidt of the Bureau of Aeronautics, Department of the Navy.

Putting Metals to Work: Shaping, forming and joining of metals, presented by George Yoder, Bureau of Aeronautics, Department of the Navy.

The How and Why of Metal Success and Failure: Why some metals are weak and others are strong, presented by Henry Stauss, Naval Research Laboratory, Department of the Navy.

Your Future in the Metals Field; New metals for new uses; your opportunities for a career in metals, presented by John C. Barrett of the Office of the Assistant Secretary of Defense, Research and Engineering.

—Metals Will Bind Our Dreams to Our Future—

Akron Sponsors Program In Metals Technology

The **Akron Chapter,** in cooperation with the Community College of the University of Akron, has initiated a program in Metals Technology. Under arrangements made with the college, a person successfully completing six of nine courses will receive a certificate of his accomplishment. Each course meets 1 hr. a week for 12 weeks. In charge of this program is the chapter's educational chairman, Russell V. Heath, Goodyear Aircraft Corp.

The following courses will be offered in the program:

Elementary Ferrous Metallurgy
Elementary Nonferrous Metallurgy
Precision Casting Fundamentals
Principles of Metal Castings
Stainless Steels
Toolsteels
Elements of Heat Treatment
Inspection of Metals
Ferrous Welding Metallurgy

Instructors will be Robert P. Shimkus, Robert W. Dively and M. Goldman, metallurgists, Goodyear Aircraft Corp., and F. B. Snyder, welding engineer, Babcock & Wilcox Co.

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review,* published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Technical Foundry Program—A two-year technical program of foundry work is being studied now at Western Michigan University in Kalamazoo. Andrew Luff, acting head of the department of industrial technology, points out that Kalamazoo is a most appropriate center for such a study as there are 212 foundries within 100 miles of the city. Emphasis will be on laboratory and theory aspects and will extend into both ferrous and nonferrous phases.

Institute to Expand—Because of the tremendous response of the metal castings industry to the courses of study offered for supervisory personnel by the American Foundrymen's Society Training and Research Institute, the five courses offered in the initial 1957 series will be considerably more extensive for 1958. The courses were held at different educational centers throughout the country, but for convenience and teaching facility, a Chicago-area location is being considered for the 1958 series.

Molded Carbon — Molded shapes of activated carbon are now available from the National Carbon Co. Featuring a high adsorption capacity, and much easier to handle than activated carbon granules of equal volume, the new cube and wafer shapes are formed from iron powdered, highly adsorbent activated carbon bonded with an organic resin, and are expected to be used in the adsorption of unwanted odors and vapors.

New Course—A nuclear reactor engineering course has been added to the chemical engineering curriculum at Lehigh University. It will consider problems in nuclear reactor design and operation.

Aluminum Cans—Light-weight aluminum cans are being produced with seamless bodies and bottoms in one piece by Kaiser Aluminum & Chemical Corp. for the Kraft Foods Division of National Dairy Products Corp.

Almanite—Almanite, combining the best properties of austenitic manganese steel and martensitic white irons, is a new metal just introduced by the Meehanite Metal Corp. It can be used wherever exceptional wear resistance and hardness are required. It can be readily cast in all forms and shapes, requires no strategic materials, has strengths as high as 90,000 psi., with ductility in the neighborhood of 15%.

Crucible Expands—Crucible Steel Co. of America has acquired 100% ownership of Rem-Cru Titanium, Inc. This acquisition will greatly increase Crucible's facilities for production of titanium and vacuum arc-melted steel products.

English Conference—A Conference on "Precipitation Processes in Steels" will be held at the University of Sheffield, England, from July 2-4, 1958. Four sessions will cover precipitation in ferritic steels, precipitation in austenitic steels, intergranular fracture in steels and precipitation during creep. Information from: The Professor of Metallurgy, University of Sheffield, St. George's Square, Sheffield 1, England.

Big Mill—A rolling mill has been developed to roll superalloys for the jet and missile age, and high-speed steels, the basic cutting material for modern metalwork, by the Latrobe Steel Co.

Rutile Plant—Metal & Thermit Corp. has opened a mine and ore processing plant in Hanover County, near Richmond, Va., to help increase the domestic source for rutile.

International Conference—The United States has accepted an invitation by the United Nations to participate in the Second International Conference on the Peaceful Uses of Atomic Energy, to be held in Geneva, Switzerland, Sept. 1-13, 1958. Persons interested in submitting papers for consideration of the Secretary-General of the U.N. should write to: Edward Gardner, Executive Director, Office for International Conference, U. S. Atomic Energy Commission, Washington 25, D. C.

High-Density Coatings—Vitro Corp. of America has announced development of a process based on electrophoretic deposition which will produce uniform, high-density molybdenum coatings.

Stellarator—Allis-Chalmers Mfg. Co. and Radio Corp. of America have been selected by Princeton University and the Atomic Energy Commission to design and fabricate the large experimental devices which will comprise a Model C Stellarator for research into controlled thermonuclear reactions.

Eliminating Gases—Eastman Kodak Co. is examining the problem of eliminating gases from nickel-plating solutions to avoid pitting of metal surfaces. The method measures gases to judge whether pitting is apt to occur and eliminates gases when known to be present.

Info Center—A Radiation Effects Information Center has been established by the Air Force at Battelle Memorial Institute to gather and disseminate data concerning the effects of nuclear radiation on materials and systems which may be required in aircraft of the future.

Carbide Coatings—A technique which provides a hard, refractory, smooth and wear-resistant coating on machined graphite parts has been developed by Horizons Inc. The coating is expected to better the performance of graphite parts now in use and a broad range of possible uses is seen, from nuclear reactors to die casting machine inserts.

Deep Insight—A 24-million volt betatron now in use at Electric Steel Foundry Co. gives off X-rays at 9/10 the speed of light and can penetrate 20 in. of steel in a matter of minutes. Use of the betatron will enable the company to furnish castings of the highest degree of quality from the standpoint of freedom from internal defects. The betatron was purchased from Allis-Chalmers Mfg. Co.

Changes Name — Sylvania Electric Products Inc. has changed the name of its Tungsten and Chemical Division to Chemical and Metallurgical Division, which name provides a clearer indication of the broad line of products manufactured by the division.

In the Soup

On p. 25 of the August issue of *Metals Review*, an item describing a substitute for tin, the Hinac Process, which was developed by the Heintz Manufacturing Co., appeared. Inquiries regarding the process have been sent to the H. J. Heinz Co.; they should be sent to: Heintz Manufacturing Co., Front St. and Olney Ave., Philadelphia 20, Pa.

Evaluates Status of Inventions

"Invention—an Art or a Science?" Was the Topic Discussed at a Recently Held Meeting of New York Chapter by Edmund M. Wise, International Nickel Co., Inc. Present were, from left: Kempton Roll, past chairman; Mr. Wise; William J. Kennelly, Jr., chairman; and Frank D. Malone, vice-chairman

Speaker: Edmund M. Wise
International Nickel Co., Inc.

At a recent meeting of the **New York Chapter,** Edmund M. Wise, assistant to the vice-president, development and research, International Nickel Co., Inc., and a past chairman of the Chapter, gave a talk entitled "Invention—an Art or a Science?"

The basic theme was that some individual must sense the need or make the crucial observation, regardless of whether he operates alone or is a member of a great laboratory. The subject was developed by Mr. Wise through a series of vignettes based on people, or topics, with a wealth of information from literature and personal observations.

Studies have shown that practically all inventors are males, and about 90% showed strong mechanical interests as boys. Studies of over 700 inventors by Rossman, of the U. S. Patent Office, indicated that over half had made an invention before they were 24, and made their most important invention before they were 45. The drop after that is in part due to responsibilities in other directions and perhaps to a more conservative attitude which rules out some of the more radical but sometimes useful proposals. Studies by Tuska of R.C.A. showed that in the number of patent applications filed per capita (generally less than 1 per 1000), the United States was below Germany and Great Britain.

Nature's method is to vary something at random and to give it a practical test. This has been practiced for a couple of billion years but is extremely slow, and presently is too costly to use except in very special and narrow problems. A direct orderly procedure for invention is possible when a definite objective exists in a well-developed field, such as mechanical and much of electrical engineering, but in the much more complex and less completely understood fields of metallurgy, biochemistry and solid state and atomic physics, good observation, good experimentation, plus intuition and very loose guidance from existing theory, are most productive. In addition, many important discoveries, such as penicillin, are the result of following an observation of a phenomenon which must have been seen previously by thousands and ignored. In addition, rare accidents may be observed and followed up—the high-temperature treatment of high-speed steel and the 27-S aluminum alloy, and the vulcanizing of rubber, are in this category.

Many inventions result from experiments, plus associated accidents, to accomplish a result by any possible means. Age-hardening had its origin in 1885, in a desire to produce a nonmagnetic hair spring for a watch, followed 20 years later by the hardenable gold platinum copper dental alloy by S. S. White in the United States, and Duralumin in Germany. Some 15 years later, a workable theory to account for this was proposed by Merica, Waltenburg and Scott, and in 1922 the speaker made the first application of this theory to intentionally produce an age-hardening alloy. The first was a special sterling silver, and this was followed by the production of a whole series of gold alloys and copper-nickel-phosphorous, copper-nickel-silicon and copper-nickel-tin alloys, all of which age-harden and are still in use.

Many inventions are byproducts of some other project—fiber glass was turned up during an investigation concerning the decoration of milk bottles and was made practical by the resistance of platinum to molten glass. In turn, the silicones were developed to bond fiber glass. Thus, two large industries, plus a good market for platinum, developed from vigorous development of side products.

The clue to the development of ductile iron arose during work to develop a wartime substitute for chromium in Ni-Hard. The result was an entirely new engineering material, utilizing an alloying element, magnesium, which had been considered entirely incompatible with iron, and not without considerable experimental support.

The Hersch oxygen meter, which accurately measures oxygen of few ppm. of other gases, is the byproduct of a research on the self-discharge of nickel-cadmium storage battery.

These were a few of the many examples cited by Mr. Wise, but they serve to stress the importance of good observation, curiosity, and the willingness and facilities to study the small hints and clues that may be encountered.

Inventors were not always held in esteem, according to Mr. Wise, because many people felt that inventions would result in fewer jobs. Inventors do not always realize financial gain from their work, as many were poor business men. Kettering realized this early and hired a good man to handle his business affairs. Inventors are usually ahead of the times, and many inventions are not recognized as important until years later.

In discussing the importance and benefits of inventions to life, Mr. Wise dwelt on the interesting observation that sales people were more ready to accept inventions than were operating men. The operating people were most resistant to change because it upsets production and always brings in unforeseen complications. Many important practical discoveries were spurred on or suggested by customers or salesmen, rather than through engineering or research personnel. One industry in particular received much benefit from customer problems in the years before it organized a large research laboratory. Other industries and companies have failed because of low research activity and lack of critical appraisal of their product.—**Reported by Alvin S. Cohan for New York.**

—Strength and Peace Through Metals—

Montreal Holds Golf Social

The **Montreal Chapter** held a very successful Golf Tournament in September, with 166 playing golf and 202 dinner guests. The champion of the greens this year, H. Brownrigg, winning low gross honors, was presented with the Rose Bowl trophy, and low net winner, G. Barry, was congratulated. One of the honored guests at the dinner was Jack Watson, twice chairman of the Ontario Chapter.—**Reported by G. F. Norman for Montreal.**

Old-Timers Are Guests of Los Angeles Chapter

Shown Is a Group of Old Timers Who Were Recently Honored at a Meeting Held by Los Angeles Chapter

Talks on Steelmaking Developments in Texas

Speaker: D. L. McBride
United States Steel Corp.

D. L. McBride, director of metallurgical process development, applied research, United States Steel Corp., addressed the **Texas Chapter** on "New Developments in Steelmaking Processes".

Dr. McBride discussed major research and developments in steelmaking and the possibilities of these new developments coming into widespread use in the near future. He discussed the commercial development of taconite and other low-grade iron ores, blast furnace operation improvements, openhearth furnace improvements, electric-arc furnace developments, pneumatic steelmaking, developments in desulphurization of hot metal and vacuum casting and melting. He also described the application of automatic controls in steel manufacturing operations and the effects that their development will have on the quality of the products produced and on the economics of manufacture.

He pointed out that the key to the adaptation of any of the new developments was its economic feasibility. The economic factors are: availability and price of raw materials, the required capital expenditures for new equipment, operating costs and the demand for the steel products produced. Dr. McBride's analysis of these factors applied to each of the processes for steelmaking led to the conclusion that the openhearth furnace method of steel manufacture is not likely to be displaced by any other method. Other methods have lower operating costs and require less capital expenditures but none can draw from the available raw materials with the versatility of the openhearth, which can make all grades of steel except the high-alloy stainless steels which are best produced in electric-arc furnaces.

The presently known iron-ore reserves of the world at the current rate of consumption should last for over 300 years; United States reserves used at their present rate will last over 200 years. These reserves include the low-grade taconite and jasper ore which contain approximately 30% iron. Exploitation of these low-grade reserves is underway and a great deal of research is being done on recovering high-grade concentrates from taconite and on agglomerating these concentrates in the best manner for blast furnace use. It has been shown that with the proper agglomerate blast furnace production can be increased up to 20%.

Improvements in the operation of blast furnaces in the last 25 years have increased pig-iron production an average of about 25 tons per furnace per day in each year. There have been some moderate improvements in coke rate in the blast furnace operation and current research on improving the coke rate is being emphasized. Research is also underway on the use of oxygen-enriched air blast. This use of oxygen has shown definite economic advantages; however, the available oxygen plant capacity is relatively small and will have to be tremendously expanded if the use of oxygen becomes wide spread.

There have been improvements in the productivity of American openhearth furnaces. This productivity has more than doubled since 1938. The current average is 123,000 tons per year with the best furnaces producing 300,000 tons per year. The increased productivity is due to the abandonment of obsolete furnaces and the construction of new steel shops with very large furnaces. Great improvements have been made in material handling and combustion practices. Oxygen has also been used in the openhearth furnace for decarburization and combustion to increase openhearth furnace productivity. Special techniques for the injection of oxygen for decarburizing in openhearths are under development.

A new method of pneumatic steelmaking which promises to displace some acid-bessemer capacity has been given a great deal of study by European steelmakers. The oxygen process employed at Linz and Donawitz, Austria, is similar to bessemer furnace operation except that the blast is introduced from the top through a lance which extends to a few feet above the metal in the vessel. High-purity oxygen is being blown rather than air.

In general, pneumatic steelmaking offers low capital cost, low operating cost and simplicity of operation but the bessemer process cannot consume scrap steel in proportion to the available supply and cannot control sulphur and phosphorous adequately. By way of improvement the basic oxygen furnace can consume appreciable amounts of scrap.

The principal advantage of the electric-arc furnace is that it can produce all grades of steel including stainless steels and special alloys. However, it has the highest operating cost of any steelmaking method and the great disadvantage of requiring a high percentage of scrap in its charge. The only way that electric-arc furnace steelmaking will be able to make a substantial increase in proportionate capacity will be the development of an economical process for converting iron ore into synthetic scrap. Some promising research is underway in this direction.

The use of vacuum melting and casting to provide small quantities of high-quality steel alloys is one of our most important recent major developments in steelmaking. Because of the complexity and cost of the furnace and casting equipment the use of vacuum cast steel is restricted to special alloys used in critical application where the utmost quality is required. The improvement in physical properties results from eliminating oxygen, nitrogen and hydrogen in solution in the steel.—**Reported by M. C. Lucky for Texas Chapter.**

Presents Talk on Russian Metallurgy

N. J. Grant, Massachusetts Institute of Technology, Presented a Talk on "Russian Metallurgy" at a Meeting Held by the Eastern New York Chapter. Shown, from left, are: Mrs. C. B. Craver, treasurer; A. A. Burr, chairman; Dr. Grant; and R. W. Guard, technical chairman of the meeting

Speaker: N. J. Grant
Massachusetts Institute of Technology

"Russian Metallurgy" was the subject of a talk given by N. J. Grant, Massachusetts Institute of Technology, at a recent meeting of the **Eastern New York Chapter.**

As guests of the Russian Academy of Science, Dr. Grant and John Chipman, past president A.S.M., toured many research institutes, teaching institutes and industrial plants. The speaker gave his impressions of the state of metallurgy in Russia.

The metallurgical personnel in Russia show a great deal of enthusiasm for their work. Their equipment, Dr. Grant felt, is on the average better in the universities and equivalent to the research laboratories found in the United States. The personnel caliber is high, relatively young and there is a great diversity of research.

The educational system in Russia attracts more metallurgical engineers than any other type of engineer. Russia graduates between 4000 to 4500 metallurgical engineers each year. They have a five-year course, the last two of which the student specializes in some narrow branch of metallurgy.

Because of the Russian economic system, an industrial plant can be operated as a full-scale experimental station. Prof. Grant noted that practically all Russian blast furnaces utilize top-pressure, as well as humidity control, high sinter charge, high blast pre-heat temperatures and oxygen enrichment where oxygen plants now exist.

Color slides of metallurgical processes and general scenery supplemented the informative talk. Dr. Grant concluded by answering several questions put to him by his audience.—**Reported by Louis Ianiello for Eastern New York.**

Panel Discusses Metal Cleaning at Tri-City

Panel members T. J. Bulat, Pioneer-Central Division, Bendix Aviation Corp., Frank Newell, Pangborn Corp., L. W. Olivier, Farmall Works, International Harvester Co., and Lloyd Gilbert, Rock Island Arsenal, discussed "Metal Cleaning" at a meeting held by the **Tri-City Chapter.** N. A. Sauter, Deere & Co., was the panel moderator.

Mr. Sauter emphasized that cleaning was an extremely broad subject to cover in one evening and that a panel approach was a good one. Also, that in most instances, there is no one best method and many other factors, such as floor space, labor, initial cost, maintenance, controls necessary, hazards and disposal of wastes generated must be considered in addition to process function.

Dr. Bulat reviewed the development of ultrasonics, starting with the Curies and ending with some of its uses today. He pointed out that ultrasonic waves cause cavitation which degasses the metal, causes collapse of voids, and releases high local, although microscopic, amounts of energy and heat.

Mr. Newell briefly touched on wire brushing, chipping, burnishing, tumbling, hydraulic blasting and polishing. He covered blast cleaning in more detail, outlining the three basic types of blast cleaning: suction blast; pressure blast; and airless or centrifugal. Operating and maintenance costs were compared, as well as the three types of shot: chilled iron; malleablized; and steel.

Mr. Olivier emphasized the economy, speed, utility and simplicity of alkali cleaning methods. He commented on materials, time and temperatures for soak cleaning, as may be required for paint stripping, spray or power washing and manual steam gun methods.

Mr. Gilbert commented on electropolishing solutions (finite—life and replenishment types) and their application for decorative work, for stock removal so as to eliminate tool marks, cold working or other stress raisers, for producing tapers not possible to machine and for removal of burrs and sand from castings. It was pointed out that this method was not suited for leaded bronze or brass and would not produce uniform results where stock was not uniform or where localized heat treatment was done. Generally, the finish obtained does not duplicate good wheel polishing. The history of both electrolytic and nonelectrolytic cleaning was reviewed. Alkaline derusting with periodic reverse can eliminate many preplate treatments. It is valuable in preparing certain high-alloy steels for plating without smutting. Whole assemblies may be cleaned and those parts rusted will be freed of rust. It was stated that the nonelectrolytic process only removed red rust and, since rust may vary widely in composition, it may sometimes be cleaned more readily by making it more rusty. After the panel presentation, questions from the floor were answered.—**Reported by Eric Welander for Tri-City.**

—Improving Metals for an Unfolding Future—

Syracuse Members Briefed On the Titanium Industry

Speaker: D. Wilson
Rem-Cru Titanium, Inc.

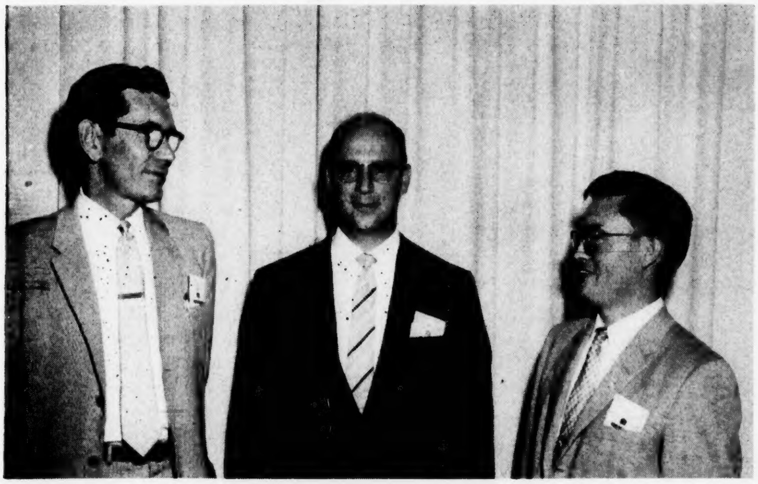
Members of the **Syracuse Chapter** recently heard D. Wilson of Rem-Cru Titanium, Inc., speak on "Titanium and the Titanium Industry".

Titanium is the fourth most abundant metal on the earth's surface, being mined extensively in India, Brazil, Mexico, Canada and the United States. Mr. Wilson discussed the increase in production in the past few years and the difficulties that had to be surmounted in order to reach a worthwhile yield.

The speaker touched briefly on the subject of the production of wrought products and the three types of alloys of titanium. The aircraft industry at present is the largest consumer of titanium. However, more uses are being found continually in chemical and related fields. Slides were shown which illustrated the many applications for which this material is used.

One of the biggest factors preventing the wide use of titanium is its cost. However, with sound advertising and promotion to bring about greater use of titanium, this factor will eventually become minimized. When this is accomplished this material will then be used to its fullest extent.—**Reported by G. Trojanowski for Syracuse Chapter.**

Cites Advantages of Cold Extrusion



John E. King, Heintz Manufacturing Co., Spoke on "New Developments in Cold Extrusion" at a Recent Meeting Held in Peoria. Shown are, from left: C. S. Black, technical chairman; Mr. King; and J. C. Frantzreb, chairman

OBITUARIES

H. T. HAMON, a member of the Ottawa Valley Chapter and a 24-year member A.S.M., passed away recently. He worked for General Electric Co.

♦ ♦ ♦

IRVING LANGMUIR, a Nobel Prize winning scientist, often regarded as one of the scientific geniuses of modern times, died Aug. 16 at Falmouth, Mass., at the age of 76. He was on the staff of the General Electric Research Laboratory from 1909 until his retirement in 1950. Holder of innumerable awards and honors, Dr. Langmuir received the Nobel Prize for his researches in surface chemistry.

Dr. Langmuir's researches were estimated to have saved the American public nearly one billion dollars per year in electric light bills, helped establish modern radio and television broadcasting, helped safeguard the lives of soldiers in battle, and more recently, provided man with a key to possible control of the weather.

Speaker: John E. King
Heintz Manufacturing Co.

John E. King, sales administration staff, Heintz Manufacturing Co., spoke before the **Peoria Chapter** on the subject "New Developments in Cold Extrusion".

The use of the techniques described by Mr. King allows commercial low-carbon killed steels to be used where heat treating grades may have been used previously. Depending on size and shape, many of these low-carbon steels can produce 90,000 psi. and greater yield due to the great amount of cold working performed. Close size tolerances can be maintained, draft angle omitted, and for this reason and because of the superior finishes produced in cold working, considerable machining can be avoided. This makes for an economical part in many cases. Billets or bars can have moderate surface defects without causing too much difficulty.

Hot rolled bars are usually used, are sawed to length, grit blasted and given a phosphate and soap coating for lubrication. Several similar cleanings and coatings may be necessary depending on the part being made. In some intricate parts, annealing may be performed between some of the operations. Mr. King illustrated the principles of forward and backward extrusion and discussed the use of each method.

A film showing the actual process on parts being produced at Heintz further illustrated the method.—**Reported by O. H. Philips for Peoria.**

Outlines Developments in Metallurgy

Past National Trustee George Fisher, International Nickel Co., Inc., Was a Guest at a Recent Meeting of the Muncie Chapter. He spoke on "Recent Developments in Metallurgy". Present were a number of past chairmen of the Chapter, including, from left: H. O. Bennett, Walter Grunden, Rodney G. Hayler, J. Dunlap McNair, Robert Peters, Alvin Holmes, Mr. Fisher, Paul Lewis, T. E. Hollingsworth, Gene P. Davis and John M. Sherry, all past chairmen of the Chapter. Mr. Fisher is past chairman of St. Louis Chapter

Speaker: George Fisher
International Nickel Co., Inc.

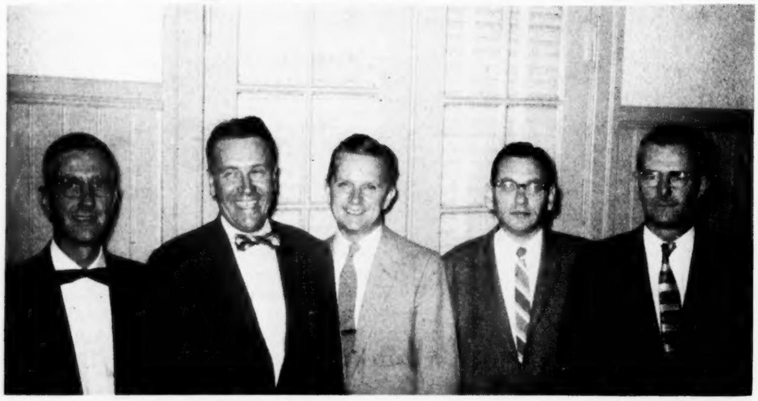
George Fisher, Development and Research Division, International Nickel Co., Inc., and a past national trustee, spoke at the National Officers Night Meeting of the **Muncie Chapter** on "Recent Developments in Metallurgy".

In particular, the importance of the development of high-purity metals of the group zirconium, molybdenum, vanadium and titanium, and the development of new alloys for these methods, was discussed. There is an important and increasing demand for high-strength, light-weight, heat-resistant materials. Data were presented showing how recent work done on the above elements is helping to meet this demand. Work done with titanium was considered to have been of great importance.

Mention was also made of new magnesium and aluminum alloys for light-weight, high-strength alloys, nickel and cobalt-base alloys for heat and corrosion resistant metals, and work done with steels, including boron steels and new treatment of low-carbon steels.

Mr. Fisher's talk was made more timely by the Russian satellite which had been launched a day previously, and to which he made reference to emphasize his points. He also stressed that our future progress will depend on our willingness to try out what is new and radically different.—**Reported by R. Myers for Muncie.**

Worcester Opens Season With Smorgasbord



Leaders as the Annual Smorgasbord Meeting Held by the Worcester Chapter Included, From Left: Ralph N. S. Merritt, Jr., Secretary-Treasurer; Lincoln G. Shaw, Past Chairman and Technical Chairman of the Meeting; Walter J. Nartowt, Chairman; Leonard L. Krasnow, Vice-Chairman; and Paul J. Lisk, Assistant Secretary. (Reported by C. W. Russell for Worcester)

Status of Metallurgists In Industry Described at Chicago-Western Chapter

Speaker: Arthur E. Focke
General Electric Co.

Arthur E. Focke, manager of materials development, Aircraft Nuclear Propulsion Department, General Electric Co., started the 1957-58 technical year of the **Chicago-Western Chapter** by presenting a thought-provoking talk entitled "The Metallurgist, the A.S.M., and the Metal Industry".

Due to the general interest of the topic, 31 high-school science instructors and principals representing about 30 schools attended this interesting meeting.

The talk was preceded by the first public showing of the film illustrating the operations of the mechanized literature searching machine developed for A.S.M. by the Center for Documentation and Communication Research, Western Reserve University. Briefly, the machine sorts out and decodes the desired references from a tape on which coded metallurgical information has been previously recorded.

The metal industry, stated Dr. Focke, accounts for one-half of the "gross national product", and since the national security depends to a large degree on the economy of the country, the role that the engineer, and indeed the metallurgist, plays in the future is of the greatest importance. The best weapon for national security is progressive productivity. This necessitates more engineers.

At this point the following three questions were presented and discussed: Are there enough metallurgists? Are they properly trained? Are they effectively used? Dr. Focke stated that, at present, the demand for metallurgists exceeds the supply; furthermore, a good deal of emphasis is placed on managerial positions as a measure of success. Consequently, metallurgists tend to broaden their field of endeavor to the detriment of specialization.

Next Dr. Focke described the role A.S.M. plays in the previously mentioned questions through the following activities: (1) Introduction of metallurgy in the early training of high school and college students, granting of scholarships, and A.S.M. award for the teaching of metallurgy; (2) promotion of further professional training through chapter activities, national meetings, seminars, transactions, etc.; (3) recognition of those who have excelled in their fields by means of the Howe Medal, the Sanveur Award, the Campbell Lecture and the Gold Medal.

The individual metallurgist, Dr. Focke suggested, should develop a strong professional attitude and endeavor to pursue a line of constructive discontent.

A very animated discussion on the drives which stimulate metallurgists and on the development of a strong professional attitude followed the talk.—**Reported by D. J. Garibotti for Chicago-Western Chapter.**

—Metallurgy—Service Today for Mankind Tomorrow—

Visit Transmission Plant

Approximately 70 members and guests of the **Purdue Chapter** met in Kokomo, Ind., for the first dinner meeting of the year. Friendships were renewed and after dinner and a few rounds of good fellowship the group adjourned to visit Chrysler Corp.'s Transmission Plant. This plant produces approximately 2600 automatic transmissions per day in a modern semi-automated plant encompassing several hundred acres.

One of the features of this plant operation is the semicontinuous heat treating facilities which are located along the production lines. The placement of such facilities eliminates the need for a central heat treating shop with attendant problems in material handling and storage. The selection of materials for the transmission parts, irons, steels, aluminum alloys and nonmetallics, as well as new methods in cleanliness and inspection, were some of the challenging problems indicated.

Fifteen high school students were invited to accompany the members on the plant visit.—**Reported by R. E. Grace for the Purdue Chapter.**

Atlanta Gavel Changes Hands

Richard Belser Accepts the Chairman's Gavel From P. J. Duffy to Become the 1957-58 Chairman of the Atlanta Chapter. (Photograph by R. L. Priess)

Young Honored by Home Chapter

National President G. M. Young, Aluminium Co. of Canada, Ltd., Was the Guest of Honor at the First Meeting Held by the Montreal Chapter This Season. He presented a talk which was entitled "The Extrusion Process". Mr. Young, left, is shown with Keith Shaw, chairman of Montreal Chapter

Speaker: G. M. Young
President A. S. M.

The opening meeting of the **Montreal Chapter** was, fittingly enough, National President's Night, with the long-time member and officer of the Chapter, and now the first Canadian ever to hold the post of national president A.S.M., G. MacDonald Young, as guest speaker. He spoke on "The Extrusion Process".

Tracing the history of extrusion back to early Egyptian times, Mr. Young described lead pipe from that era apparently extruded although no records of the process employed have been found. He described the equipment used about 1500 A.D. for rolling of lead "H" sections for window framing and the development of the hydraulic press and direct and indirect processes. Aluminum was first extruded in North America in 1904. He described the flow of metal during extrusion, variations in structure within an extrusion ingot, changes brought about by thermal treatment, and effect of grain size on mechanical properties.

A recent development of interest is a press built by Schloemann for the extrusion of aluminum sheathing over insulated cable. Among the outstanding examples of extrusion applications in Canada was the use in 1946 of an aluminum external facing on the Laurentien Hotel in Montreal. The first aluminum highway bridge, built at Arvida, Quebec, contains many extruded components and for some years Canadian car builders have utilized aluminum extrusions in constructing box cars, hopper cars and mine cars. Dominion Coal Co. Ltd. has 1400 of the latter in use in their Nova Scotia operations.—**Reported by E. J. Cuyler for Montreal.**

Indianapolis Hears Talk on Residual Stress Measurement

Speaker: E. S. Rowland
Timken Roller Bearing Co.

E. S. Rowland, chief metallurgical engineer, Steel & Tube Division, Timken Roller Bearing Co., talked on "Residual Stress Measurement Evaluation" at **Indianapolis.**

Dr. Rowland suggested that Mark Twains' comment on the weather might be applied to residual stress, "Everyone talks about it but nobody does anything about it". Using charts, Dr. Rowland described the correlation obtained by cooperating laboratories on six different types of specimens. Five different methods of evaluating stress in depth were used by the 20 laboratories participating in this project. Dr. Rowland indicated that X-ray diffraction is probably the most accurate way of determining residual stresses at the extreme surface. He outlined a program of further work which will attempt to correlate residual stresses with fatigue strength.—**Reported by R. M. Cage for Indianapolis.**

Gives Hints on Selecting Steel Sheet

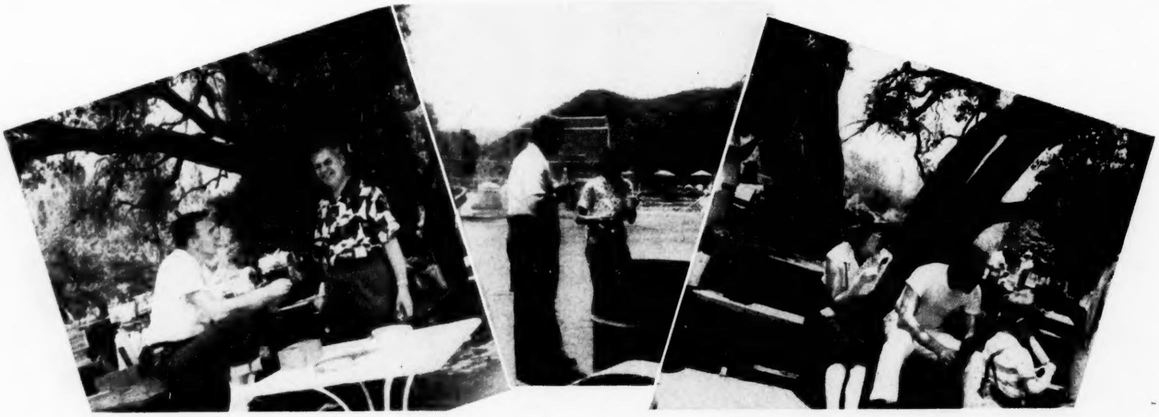
W. B. Kennedy, Metallurgical Engineer, Columbia-Geneva Division, U. S. Steel Corp., Spoke on "Manufacture and Selection of Steel Sheet" at a Meeting of the Golden Gate Chapter. Shown are, from left: Wally Ericksen, chairman; Mr. Kennedy; and Malcolm McGregor, educational chairman

Speaker: W. B. Kennedy
Columbia-Geneva Division
U. S. Steel Corp.

"Manufacture and Selection of Steel Sheet" was the subject of a talk given by W. B. Kennedy, Columbia-Geneva Steel Division of U. S. Steel, at **Golden Gate Chapter.** The main feature of the talk was an excellent, late release movie entitled The Production of Steel Sheets. By means of the movie, viewers are taken on a tour of a modern steel mill with hot strip and cold reduction facilities. Steel mill machinery and equipment including the latest electronic thickness control devices are presented in a logical sequence.

The movie was followed by a slide-illustrated talk in which points presented in the movie were repeated for further emphasis. Steel sheet quality considerations were discussed and it was pointed out that proper processing of customer orders is facilitated by accurate end-use information which is supplied to the steel mill by the customer.—**Reported by F. R. Sullivan for Golden Gate.**

San Fernando Holds First Annual Picnic



San Fernando Valley Celebrated Its First Successful Year as a New Chapter by Staging a Picnic at Lake Enchanto in the Malibu Mountains, West of Los Angeles. Over 100 members, guests and children enjoyed the all-day affair. Shown, top left, are Keith Lampson and Chairman Don Roda; at center are Marty and Mrs. Binstock; at right John and Mrs. Greenwood

Reports on Machining With Ceramic Tools at West Michigan Meeting

Speaker: Norman Zlatin

Metcut Research Associates

Norman Zlatin, a partner in Metcut Research Associates, presented a talk on "Machining With Ceramic Tools" at a meeting held by the **West Michigan Chapter.**

With the advent of ceramic tools, phenomenal claims have been made for machining advances. However, not much has been said about some of the pitfalls that may be encountered. As with any new tool, certain techniques have to be followed for its successful application. This was encountered when the carbide tool was introduced.

The tool usually consists of approximately 98 to 99% aluminum oxide and a suitable binder. The physical properties are determined to a large extent by the type of binder and the grain size of the aluminum oxide. Ceramic tools have the advantage over the other tool materials in that they contain no strategic materials, have a high resistance to oxidation, retain their hardness at elevated temperatures and have high compressive strengths. However, the tensile strength is low and the tools are brittle.

Ceramic tools should be ground with diamond wheels in a manner similar to that used for carbide tools. A ceramic tool works satisfactorily when used in the form of a throw-away type tool blank. In other words, it can be used in the same type tool holders as used with carbide throw-away tools. These tool holders provide negative rake angles. A mechanical-type chip breaker should be used.

Ceramic tools have shown their superiority over conventional carbide tools in a number of tests. However, it should be pointed out that a comparison should be made with the harder-type carbides since, in the case where ceramic tools work satisfactorily, the harder grades of carbide should have been used. There are many cases where improvements in operation may be obtained by using a harder grade of carbide.

The wearland on a ceramic tool should not be allowed to exceed 0.015 in. Using a cutting speed of 400 ft. per min. on 4340 steel at 400 Bhn., a feed of 0.009 in. rev. and a depth of cut of 0.030 in., a tool life of 18 min. was obtained with a carbide tool and 39 min. with a ceramic tool.

The ceramic tool is not recommended for machining titanium, jet engine alloys, rough surfaces or interrupted cuts. Its main application at the present time appears to be in light cutting operations and machining of plastics and other nonmetallics. It should be remembered that the power requirements increase approximately in direct ratio to the cutting speed and hence, at the higher cutting speeds higher horsepower equipment is needed. The set-up should be free from vibrations.—**Reported by Robert C. Behnke for West Michigan.**

—Metallurgy—Servant of Mankind—

Tour Mallory-Sharon Plant

Members and guests of the **Warren Chapter** met at the Mallory-Sharon Metals Corp. in Niles, Ohio, for an interesting tour of the plant's facilities for the production of titanium sheet from titanium sponge.—**Reported by J. O. Williams for Warren Chapter.**

Hot Work Die Steels Is Subject at Long Island

Speaker: L. A. Hauser

Universal-Cyclops Steel Corp.

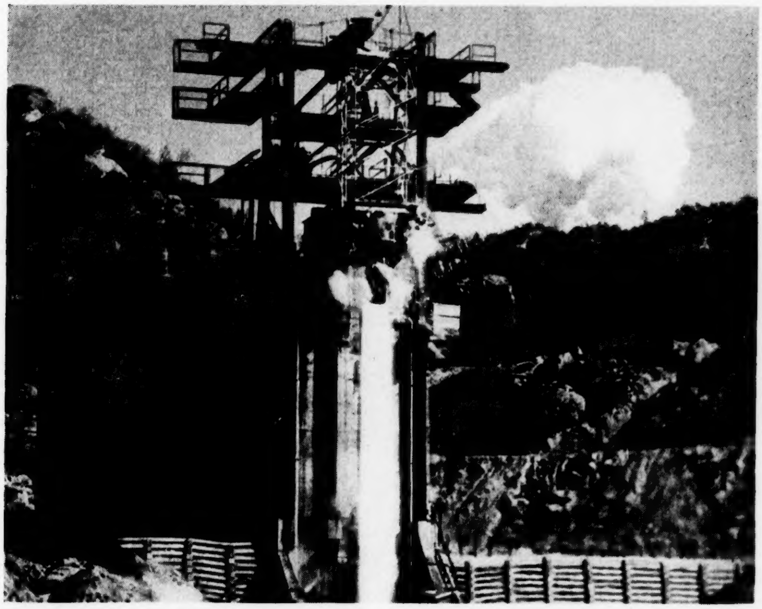
L. A. Hauser, technical service metallurgist, Universal-Cyclops Steel Corp., presented a talk on "Hot Work Die Steels for Future Aircraft Vehicles" at a meeting of the **Long Island Chapter.** Drawing upon more than 16 years experience in the field of tool and die steels, Mr. Hauser centered his talk on the use of these materials in the major industry of Long Island—aircraft production.

Mr. Hauser opened his talk with a comprehensive report on the problem facing the aircraft industry at the present time—the increase in temperature due to greater speeds has created a need for better high-temperature materials. Based on increased speed, he presented comparative data on the ultimate strength and strength-weight ratio of several alloys now in use.

Mr. Hauser then spoke on tool and die steels and their properties. He stated that the 5% chromium hot work die steels are the most widely considered toolsteels for aircraft structural applications. He compared die steel characteristics with those of other alloys, in reference to strength against hardness at room and elevated temperatures and strength-weight ratio. Other factors which were discussed included coefficient of expansion, low strategic alloy content, ease of hardening, corrosion resistance, fabrication, weldability, and availability of formed steel.

In concluding, he reviewed the outstanding advantages of the use of 5% chromium die steels in high-temperature applications.—**Reported by A. P. Ingraham for Long Island.**

Visit Propulsion Field Laboratory



Members of the San Fernando Valley Chapter Visited the Propulsion Field Laboratory of Rocketdyne Earlier This Year to See a Demonstration of the Power Developed by Rocket Engines as Measured on Static Test Stands

Earlier this year, 78 members of the **San Fernando Valley Chapter** enjoyed a preview of a 4th of July celebration that will outshine any in their memories for years to come in a visit to Rocketdyne's propulsion field laboratory, located in the Santa Susana Mountains west of the San Fernando Valley.

The field laboratory is the free world's most active and advanced test laboratory for research, development and acceptance testing of large liquid propellant rocket engines. These power plants are used in the nation's major missile programs, including Atlas, Thor, Redstone and Jupiter.

Special buses were chartered to take the visitors to the field laboratory and to visit the test sites to see a live demonstration of power for outer space. Following dinner in the Area II cafeteria, Bob Lodge, assistant section chief of the engineering test section, gave a briefing on rocket engines and the growth, general functions and responsibilities of the field laboratories.

Three firings went off on schedule, giving an excellent demonstration of rocket engine development testing. The trip was completed with a tour through one of the engine test control centers.—**Reported by Ed Reed for San Fernando Valley.**

A.S.M. created the Annual Teaching Award in Metallurgy, open to teachers of metallurgy in the United States and Canada. Value $2000.

Speaks at Notre Dame on Metal-Ceramics Combination

Speaker: T. F. Frangos

Haynes Stellite Co.

T. F. Frangos, sales engineer for Haynes Stellite Co., gave a talk entitled "Metal-Ceramic Combinations" at a meeting of **Notre Dame.**

Mr. Frangos stated that Haynes Stellite has been in the development of metal-ceramics combinations for about ten years. The need for gas turbine blades to withstand high temperatures prompted them to enter this field. Essentially this type of material is made by bonding a ceramic with a metal binder.

The speaker gave a listing of the companies that are engaged in this type of work. He stated that the following methods are used by fabricators: slip casting, hydrostatic pressing and metal impregnation. Haynes Stellite uses the slip casting method.

To date these methods have not overcome the poor impact strengths. This shortcoming has prevented the use of metal-ceramics for gas turbine blades. Mr. Frangos showed examples of parts being made for the trade. In several instances they are giving outstanding service.—**Reported by R. C. Pocock for Notre Dame.**

M.E.I. Is on the Move!

As the weeks go by, the A.S.M. Metals Engineering Institute continues to broaden its service to the metal industry. As evidenced by the remarkable enthusiasm displayed by visitors to the A.S.M. center at the Chicago Metal Show, employers and employees throughout the country are eager to utilize the extensive resources of M.E.I.

A short time ago, the flight propulsion laboratory department of General Electric Co., Evendale, Ohio, enrolled 25 of their personnel in Course #16, High-Temperature Metals. They certainly must have been well pleased, for following that enrollment, an additional class of 27 began the same course in another department, the aircraft gas turbine department.

They're up to date in Kansas City too! Located there is the Sheffield Steel Co. that recently requested Course #1, Elements of Metallurgy, for 32 of its people. So it goes, in both in-plant and home study, M.E.I. is on the move toward sound training and planned instruction in the metal industry.

Describes Results of Grinding Research

L. P. Tarasov, Research Engineer, Norton Co., Spoke on "Some Results of Grinding Research" at a Meeting Held Recently by the Dayton Chapters A.S.M. and A.S.T.E. At the meeting were, from left: W. T. Bryan, chairman; Mrs. Helen Morris, Ohio Bell Telephone Co., coffee speaker; Dr. Tarasov; and G. Brandt, chairman of the Dayton Chapter A.S.T.E.

Speaker: Leo P. Tarasov
Norton Co.

Grinding is related to milling with regard to chip formation, but it differs greatly in another important respect, according to Leo P. Tarasov, research engineer, Norton Co., who addressed a joint meeting of the Dayton Chapters A.S.M. and A.S.T.E. He stated that, whereas in conventional machining tool wear should ideally be at a minimum, in grinding the wheel must wear at a rate which is appropriate for the operation involved in order to present new cutting surfaces to the work. Wheel wear is a blended function of three factors—attrition of the abrasive; fracture of the abrasive grain; and fracture of the bonding material.

Grindability, defined as the ratio of volume of metal removed per unit volume of wheel wear, is greatly decreased in steels by addition of large amounts of vanadium and chromium, which form extremely hard carbide particles. It is not affected by the nature of the quenching medium.

As the wheel speed decreases, wheel wear increases for most steels. With some of the newly developed materials, like titanium and zirconium, the reverse is true. In these cases, decreased wheel speed results in a lower instantaneous temperature at the point of grinding contact and this reduces the wear caused by surface chemical interaction between the abrasive and metal. Materials such as these can be ground readily with the help of special grinding fluids that minimize wheel wear.

Stresses occur in any machining or grinding operation. And, contrary to general belief, tensile stresses do not necessarily lower fatigue strength. Data were cited to show that tensile grinding stresses up to 60,000 psi. did not lower the fatigue strength of hardened steel test specimens.

The talk was concluded with descriptions of grinding failures and the methods used to determine the cause of the failure. It was pointed out that successful trouble shooting depends upon full cooperation between tool engineers and metallurgists.—**Reported by Joseph Warga for Dayton.**

Points Out Causes of Failures in Metals

Speaker: Gerald R. VanDuzee
Sikorsky Aircraft Division

Gerald R. VanDuzee, senior materials engineer, Sikorsky Aircraft Division, presented a talk on "Causes and Prevention of Fatigue Failure in Metal Parts" at a recent meeting held by the **Northeast Pennsylvania Chapter.**

Mr. VanDuzee opened with a brief discussion of the relationship between hardness, tensile strength and endurance limit. He pointed out the detrimental effect of notches upon endurance limit. The behavior of defects as notches with the resultant lower endurance limit was pointed out by the speaker.

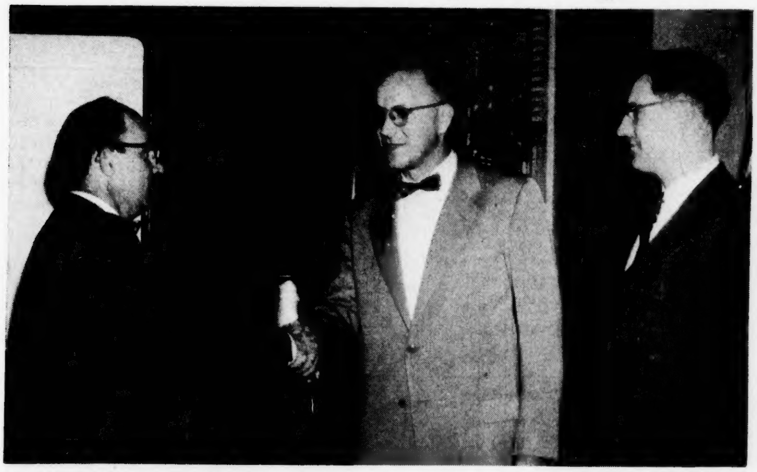
His talk included presentation of various slides indicating causes and failure in metal parts, followed by a discussion of the engineering and inspection implications of the cases illustrated.

Some of the most troublesome defects mentioned were forging and casting defects, grinding cracks, inclusions, hydrogen embrittlement, retained austenite and the use of incorrect heat treating temperatures. Failures which resulted from poor shop practice such as deburring and from poor designs were also shown. A question period concluded the talk. **—Reported by R. L. Ward for Northeast Pennsylvania.**

Defines Role of Engineer at Hartford

Hiram Brown (Center), Solar Aircraft Co., Spoke on "Proper Utilization of Engineers" at a Meeting Held by the Hartford Chapter. On the left is Claire McDonald, chairman, and on the right, John Mertz, technical chairman. Mr. Brown spoke about the need for cooperation between engineers and companies in order for this proper utilization to work. He showed a typical laboratory organization where engineers, chemists and metallurgists did the thinking and planning, and technicians under supervisors and foremen did the work. This involved setting up extensive procedures and test cards, and a training program for technicians, but it did allow the college trained personnel to get away from the routine jobs and stick to engineering-type work. (Reported by B. L. Taft for Hartford)

Outlines Details of Project Vanguard



"Project Vanguard" Was the Topic Discussed by Raymond G. Sipe, Manufacturing Business Manager for the Nuclear Division of The Martin Co., at a Meeting Held by York Chapter. Shown are, from left: Julian D. Carey, Jr., program manager; Mr. Sipe; and Charles W. Walter, program manager

Speaker: Raymond G. Sipe
The Martin Co.

Raymond G. Sipe, manufacturing business manager for the Nuclear Division of The Martin Co., spoke before the **York Chapter** on "Project Vanguard", a name assigned to the Department of Defense portion of the program for a man-made instrumented satellite to be launched during the International Geophysical Year.

The Martin Co. is the prime contractor for the launching vehicle. In physical appearance the satellite launching vehicle will resemble a giant rifle shell. It will be one of the first large rockets designed to be controlled without the use of fins.

Physically the unit consists of three stages, beginning with a first stage approximately 45 ft. in length, closely resembling a Navy-Martin Viking rocket. This first stage, which launches the entire assembly, will burn out of all fuel at an altitude of approximately 30 miles and then separate, drop off and fall to earth in the test area about 230 miles from the launching point. The second stage will start firing and at a certain time during the second stage burning will jettison its nose, leaving the contained third stage and the satellite exposed. The second stage rocket, after its burn-out, will continue to coast upward until it attains the satellite's intended orbital altitude, some 300 miles above the earth. The third stage rocket, carrying the spherical satellite, has no guided system, no electronic brain to direct its flight. Its job is to boost the satellite speed to approximately 18,000 mph. in orbital flight, parallel to the earth's surface. This high speed, necessary to counteract the earth's gravitational pull, will be obtained at the rocket's burn-out. At burn-out the satellite should be nudged ahead by means of a releasing device in the nose of the rocket. Therefore, its speed will be slightly greater than that of the rocket shell which will not drop to earth but will trail the satellite until atmospheric drag causes both gradually to slow down and spiral toward a lower atmosphere. Through friction induced by passing into this denser atmosphere, both satellite and rocket will burn briefly and disintegrate after the manner of meteors.

The orbital time for the man-made moon has been estimated from a few days to a few years. To trace the satellite in its orbit, 75 moon watch stations have been established for observation. Radio tracking stations are also under construction. It is hoped that information, both from the watching and tracking stations as well as the contained instrument transmitters can be learned concerning: (1) cosmic rays; (2) earth shape; (3) accuracy of distance measurements on the earth; and (4) meteorological observations.

The basic hope for the company manufacturing the launching vehicle is to be able to reverse the old adage into "What goes up, must stay up".—**Reported by W. H. Johnessee for York.**

—ASM Educational Services for Metaldom—

President Young Is Guest At Ottawa Valley Meeting

Speaker: G. M. Young
President A.S.M.

The **Ottawa Valley Chapter** heard G. MacDonald Young, president A.S.M. and technical director, Aluminum Co. of Canada Ltd., recently.

As a preliminary the current projects of the A.S.M. were discussed in some detail, especially the futures of the education program and the proposed new headquarters in Cleveland. Following this introduction, Mr. Young turned to the main topic of the evening's talk, "Light Alloys in Heavy Industry", which concerned the use of aluminum-magnesium alloys in such fields as shipbuilding, road and rail transportation, building and general construction work.

Following the discovery of these alloys at the turn of the century, their development was somewhat overshadowed by fear of stress corrosion and the fact that the "Duralumin" aluminum-copper alloys had been discovered which were amenable to heat treatment. In spite of the great use of these latter alloys over the past 50 years, they have the disadvantage that welding, torch cutting and hot forming operations affect mechanical properties because of the susceptibility to heat treatment. For this reason interest has always been maintained in the aluminum-magnesium system since these alloys are in the intermediate tempers or even in the annealed condition relatively strong, ductile and corrosion resistant, and can be welded without significantly altering the properties of the surrounding material. These alloys, however, have always been considered susceptible to stress corrosion failure. Mr. Young went on to discuss in some detail the mechanism of stress corrosion, particularly the electrochemistry of grain boundary attack. The effect of various quenching and annealing treatments to simulate grain boundary precipitation under tropical and service condition was then discussed, together with accelerated stress corrosion tests and their function in the development of the current Alcan alloys B54 and A56. In this connection, the effect of chromium and manganese additions on the control of grain size and the mode of precipitation of the beta phase was described.

In conclusion, Mr. Young outlined modern techniques for joining these alloys which demonstrated the superiority of the inert-gas shielded consumable electrode welding, and quoted numerous examples of the use of the aluminum magnesium alloys in heavy industry, particularly in the fields of transportation, which indicated the tremendous pay-load savings possible in this field: a typical example being the saving of 600,000 ton/miles in an all-aluminum boxcar over a period of eight years. Throughout, the talk was well illustrated with pertinent slides, graphs and pictures.

The coffee speaker for the evening was S. L. Gertsman, chief of the Physical Metallurgy Division, Department of Mines and Technical Surveys, who outlined the conception, growth and progress of the Ottawa Valley Chapter.—**Reported by J. O. Edwards for Ottawa Valley.**

CHAPTER MEETING CALENDAR

Akron	Jan. 15	Sanginiti's	Social	Ladies Night
Albuquerque	Jan. 16		L. O. Richardson, Sr.	Materials Research and Development in the U. S. A. F.
Baltimore	Jan. 20	Engineers Club		The A.E.C.'s Fast Reactor Program
Boston	Jan. 3	M.I.T. Faculty Club	Wilfred Dukes	
Calumet	Jan. 14		Social	Ladies Night
Carolinas	Jan. 16	Winston-Salem		
Cedar Rapids	Jan. 14	Roosevelt Hotel	H. L. Geiger	The Nickel Industry
Chicago	Jan. 13	I. I. T.	J. R. Vilella	Recent Developments in Metallography
Chicago-Western	Jan. 20	Old Spinning Wheel	D. W. Levinson	Metals for Rockets, Jets and Guided Missiles
Cleveland	Jan. 6	Hotel Manger		Zay Jeffries Night
Columbus	Jan. 8	Broad St. Church	E. E. Bishop	Art of Spark Testing
Dayton	Jan. 8		W. D. Manly	Nuclear Reactor Materials
Delaware Valley	Jan. 15		G. R. Fitterer	Steelmaking—Blast Furnace and Openhearth
Detroit	Jan. 13		F. B. Rote	Graphitic Iron Castings in Modern and Future Automobiles
Eastern New York	Jan. 10	Panetta's	Mr. Schockley	Semi-Conductors
Ft. Wayne	Jan. 13	Hobby Ranch House	H. Apkarian	High-Temperature Bearing Materials
Golden Gate	Jan. 6	Spenger's Grill	D. P. Herron	Nuclear Reactor Components
Hartford	Jan. 14	Indian Hill Club	R. W. Moeller	Trends in Surface Protection of Metals
Indianapolis	Jan. 20	Village Inn	M. Semchyshen	Molybdenum-Base Alloys
Los Angeles	Jan. 23	Rodger Young Auditorium	A. J. Herzig	Molybdenum Metals and Its Promising Alloys
Louisville	Jan. 7	White Cottage		National Officers Night
Mahoning Valley	Jan. 7	Columbiana	Plant Tour	Kaiser Chemical Division
Milwaukee	Jan. 24	Serbian Hall	Social	Winter Carnival
Minnesota	Jan. 22	Calhoun Beach Hotel	D. W. Martin	Powder Metallurgy
Montreal	Jan. 6	Queen's Hotel	D. D. Smith	Machinability of Metals
New Haven	Jan. 16	Waverly Inn	M. C. Fetzer	Secondary Fabrication of Aluminum
New Jersey	Jan. 20	Essex House	G. F. Sullivan	What's Ahead in Metallurgy
New Orleans	Jan. 8	Lenfant's Seafood House	H. E. Van Volkenburg	Reflectoscope Inspection
New York	Jan. 6	Brass Rail		Physiological Effects of Radioactivity
North Texas	Jan. 9		A. E. Focke	The Metallurgist—The A.S.M. and the Metals Industry
Northeast Pennsylvania	Jan. 9	Irem Temple Country Club	R. B. Oliver	Current Methods of Nondestructive Testing
Notre Dame	Jan. 8	Nabicht Bros.	H. V. Hunsicker	Heat Treatment of Aluminum Alloys
Oak Ridge	Jan. 15	K. of C. Hall	M. G. Fontana	Unusual Problems in Corrosion
Ontario	Jan. 3	Royal Connaught	G. E. Willey	Nonferrous Metals in the Iron and Steel Industry
Ottawa Valley	Jan. 11	Landsdown Park	Social	Ladies Night
Peoria	Jan. 13	American Legion Bldg.	H. R. Neifert	Fatigue Failure and Residual Stresses
Philadelphia	Jan. 31	Engineers Club	R. H. Harrington	Psychological Problems in Metallurgy
Philadelphia-Jr. Section	Jan. 13	Navy Yard	Tour	Navy Yard
Pittsburgh	Jan. 9	Gateway Plaza	H. Kessler	Metal, Men and Molds
Rhode Island	Jan. 8	Hummocks Grill	B. W. Gonser	Uncommon Metals
Rockford	Jan. 22		J. E. Drapeau, Jr.	Standard of Living Raised Through Powder Metallurgy—Youth Night
Rome	Jan. 6	Trinkus Manor	Q. D. Merkhan	Isothermal Heat Treatment
St. Louis	Jan. 17	Congress Hotel	W. A. Darran	Selection of Furnace Design
Saginaw Valley	Jan. 14	High Life Inn	F. E. Dreves	Machinability of Cold Finished Steel
Savannah River	Jan. 9	Timmerman's Lodge	R. H. Pry	Magnetic Materials
Springfield	Jan. 20	Blakes Restaurant	H. Nystrom	Automotive Gasoline Injection
Texas	Jan. 7	Ben Milam Hotel	E. J. Krabacher	Metallurgical Aspects of Machinability
Tri-City	Jan. 14	American Legion	N. Zlatin	Metal Cutting
Utah	Jan.		J. A. Comstock	Engineering Properties of Iron Powder
Warren	Jan. 9	Astoria Cafe	Panel	Can Quality Control Help You?
Washington	Jan. 13	American Assoc. of University Women	G. A. Timmons	Molybdenum and Its Alloys
West Michigan	Jan. 20	Schnitzelbank Restaurant	A. W. Demmler	Heat Treatment of Cast Irons
Worcester	Jan. 9	Hickory House	C. F. Floe	Nitriding and Carbonitriding
York	Jan. 8	York	R. Mirror	Corrosion

Members and Lady Guests Tour Jones & Laughlin Facilities in Pittsburgh

The annual Members and Ladies Day Tour sponsored by the supplementary meetings committee of the **Pittsburgh Chapter** consisted of a tour of the No. 4 openhearth shop and the 46-in. blooming mill of the South Side plant of the Jones & Laughlin Steel Corp., followed by dinner at the Park Schenley Restaurant.

The openhearth shop is considered one of the newest in the industry as it is only 10 years old. Eleven furnaces comprise the shop, which has a capacity of 275 tons per heat per furnace. The furnaces are gas fired recuperative and tapping is carried out on a 9-hr. norm. The most modern methods available are used in the operation of these furnaces; hot ladle additions are made from an 800-ton mixer and an oxygen lance is used to reduce the amount of impurities present following melt down. Heat analyses are on a 20-min. interval and tapping follows into a 300-ton ladle.

The ingots are stripped in a separate building and then transported to the soaking pits. The pits visited in D Section supply the 46-in. blooming mill which is capable of rolling 280 tons per hour. Five men control the rolling operation from a safety glassed, air-conditioned pulpit. Blooms are surface conditioned by automatic equipment and sheared to length for storage and cooling.

The tour was very well conducted and all present were impressed by the cleanliness of the shop visited and by the high degree of organization in the operation.—**Reported by John T. Howat, Jr., for Pittsburgh.**

Talks on Electrophoretic Deposition

J. J. Shyne (Left), Project Engineer, Reaction Motors, Inc., Spoke on "Electrophoretic Deposition of Metals and Refractory Materials" at a Meeting Held in Los Alamos. He is shown with John Bender, program chairman

Speaker: J. J. Shyne
Reaction Motors, Inc.

J. J. Shyne, project engineer, Reaction Motors, Inc., presented a talk entitled "Electrophoretic Deposition of Metals and Refractory Materials" at a recent meeting of the **Los Alamos Chapter.**

Electrophoretic deposition is a coating application technique particularly suited for precision coating complicated shapes. It is possible to apply metals, metal alloys and cermet coatings which cannot be applied by electroplating. Molybdenum, nickel-tungsten carbide, nickel-chromium, nickel-iron-chromium, and rare earth oxides are a few of the coatings which have been applied to a base metal by this method.

The coating is deposited with plating voltages of 100 to 500 v.d.c. from a suspension preparation in which the particle size ranges from 1-10 microns. The air dried coatings are treated by a low-temperature hydrogen reduction in the case of the metallic oxides. Hydrogen reduction is not necessary with coatings of the metal powders. The coating is next densified by peening, rolling, or by isostatic pressing, the latter method being particularly convenient for small items. After densification the coating is sintered in a hydrogen atmosphere.

Mr. Shyne pointed out the importance of electrophoretic deposition in that it offers an extension of powder metallurgy practices to the coating field and makes available to industry a wide range of specialized metal and cermet coatings.—**Reported by Robert W. Keil for Los Alamos.**

Carolinas Chapter Greets New Officers

Pictured During the Installation of the New Officers of the Carolinas Chapter Are, From Left: V. J. Vierling, Treasurer; M. Milo, Director; J. L. Highsmith, Vice-Chairman; A. B. Cooper, Retiring Chairman; and R. J. Polivka, Chairman. (Reported by Paul A. Stalder for Carolinas)

Note to Graduates

During the last war terrible damage was done to the Technical University in Berlin. The buildings are being replaced and the University is resuming its former position as an important educational institution for inquiring minds.

One thing must be reconstituted bit by bit, and that is the alumni records. This note is therefore an urgent request to any graduate of the Technische Hochschule to forward a little information to the undersigned—namely, the year of his entrance, the year of graduation, his present address and his present occupation.

Prof. Dr-Ing. P. Riebensahm
Berlin-Charlottenburg
Hardenbergstrasse 23
Berlin, West Germany

Cermets and Sintered Metals Discussed

M. F. Judkins (Right), Director, New Products Development, Firth Sterling, Inc., Discussed "Cermets and Sintered Metals" at a Meeting in Milwaukee. Shown with him is Ed Witort, technical chairman of the meeting

Speaker: M. F. Judkins
Firth Sterling, Inc.

Malcolm F. Judkins, director, new products development, Firth Sterling, Inc., discussed the properties, application and new developments in the field of "Cermets and Sintered Metals" before the **Milwaukee Chapter.**

Mr. Judkins defined the objectives of research in the field of cermets for the combination of the virtues of ceramic materials and metals.

The use of cermets in the generation and utilization of high temperatures is the most promising field of application of these materials. A problem to be overcome in development of high-speed missiles and aircraft is the thermal barrier. As speed of flight surpasses the speed of sound, known as Mach 1, the thermal barrier is approached. An object moving through air at high speed causes stagnation of air at the leading edge of its components which results in a rapid temperature rise of the moving object. The temperature generated at Mach 1 is about 200° F. Mach 2, or twice the speed of sound, generates 500° F. and Mach 3 generates about 1000° F.; around Mach 10 and over the temperature rise becomes meteoric and we know of no substance which melts higher than 7500° F.

Design of high-speed missiles must be based on the high-temperature properties of materials with attention to creep strength. Room temperature properties are no longer usable. Aluminum is limited to speeds below Mach 2, titanium is limited to Mach 3, high-temperature stainless steel alloys are usable up to 1300° F., and cobalt and tungsten-based superalloys can maintain usable strength properties up to 1700° F. Cermets are the only known materials that can survive above 1700° F. These materials offer the greatest hope for a high-temperature material that can survive the re-entry of a missile into the earth's atmosphere after the expiration of powered flight.

Many cermets have been investigated. The resistance to high temperatures has been achieved, but poor impact strength is a property of cermets that has not been overcome. The properties of several types of cermets and intermetallic compounds were discussed by Mr. Judkins. Spray formed and coatings of chromium-nickel-borides are a promising group of materials presently under investigation. Mr. Judkins expressed confidence that the brittleness problem in cermets would eventually be solved.—**Reported by J. D. Sullivan for Milwaukee Chapter.**

New Films

Cobalt in Katanga
Cobalt Deficiency in Ireland
Hard Facing With Stellite

Three films which can be obtained from the Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio. "Cobalt in Katanga", a 35-min. sound and color film which presents the story of cobalt production in the Belgian Congo through mining, concentration, refining and reduction of the elemental metal, was produced in the Belgian Congo by Union Miniere du Haut-Katanga.

"A Study of Cobalt Deficiency in Ireland" is a 27-min. sound and color movie depicting the need for cobalt as a trace element in the diet of ruminant animals, particularly sheep. It was filmed in Ireland by the Mond Nickel Co.

A technical instruction movie on hard facing with Stellite which was produced in England by Deloro Stellite Ltd.

Jackson Members Tour

Seventy-five members of the **Jackson Chapter** made a plant tour of the Albion Malleable Iron Co. at Albion, Mich., at the opening meeting this season. This foundry produces malleable iron castings for the automotive, farm equipment and road equipment industries.

The modern methods of producing malleable iron proved interesting to all who attended. W. Truckenmiller, A.S.M., conducted a tour through the well-equipped laboratory for product research metallurgical analysis and quality control and answered questions pertaining to the facilities visited.—**Reported by W. F. Stewart for Jackson Chapter.**

Turns Over Gavel at Edmonton

C. A. Hiltz (Right), Past Chairman, Hands Over the Gavel to the Incoming Chairman, J. G. Parr, at Election Night Meeting of Edmonton Chapter

Presents Talk on Modern Heat Treating Equipment

Speaker: R. F. Novy

Lindberg Engineering Co.

A talk on "Modern Heat Treating Equipment" was presented at a meeting of the **Carolinas Chapter** by R. F. Novy of the research staff of the Lindberg Engineering Co.

Mr. Novy discussed advancements in furnace design and their application to heat treating processes in industry. Since almost all modern heat treating furnaces are designed to operate with some type of controlled atmosphere, the various types of gases and prepared furnace atmospheres were mentioned; special emphasis was given to the versatile endothermic-type atmospheres possessing carbon control characteristics by controlling the dew point of the atmosphere through adjustment of the air-gas ratio to the generator. Charts showed the relationship of dew point to carbon potential at various furnace temperatures.

In the application of protective atmospheres, special considerations must be given to furnace design. Shown were diagrams of furnaces which possessed gas-fired radiant tubes to keep products of combustion from contaminating the protective atmosphere. Slides illustrated the application of radiant tubes to various furnace designs ranging in size from small batch-type furnaces containing 8 tubes to a 3-row pusher carburizer utilizing over 100 tubes. Illustrations were shown of various toolsteel and stainless steel processes where proper application of controlled atmosphere resulted in improved quality at lower costs.

The speaker said that controlled atmospheres are always applicable to all heat treating processes of various materials, and presented examples of the annealing and degassing of titanium. Here vacuum high-temperature processing was required. Basic furnace design and pumping equipment were discussed along with actual furnace installations to illustrate the fast-growing trend toward vacuum technology in heat treating.

In summary, Mr. Novy said that applying properly controlled atmosphere and heat treating equipment results in cost reductions with increased quality by giving superior results with a given steel, reduces or eliminates finishing costs and makes possible wider use of the lower class of steels.—**Reported by Paul A. Stalder for Carolinas.**

A.S.M. prepares and distributes, on request, preprints of the technical and scientific articles presented at the annual convention.

At San Diego Chemical Milling Panel

Members of the San Diego Chapter Opened the Current Season With a Symposium-Type Meeting on "Chemical Milling". Speakers were Daryl Mitton, chief engineer, National Plating & Processing Co.; Victor Tronolone, Missile Research Section, North American Aviation; and George Fox, Chem-Mill Division, Turco Products, Inc. Dr. Mitton is shown describing a chem-milled aircraft panel to John V. Long, past chairman of the chapter's educational committee, while Mr. Tronolone and Mr. Fox look on. (Reported by Owen Walker for the San Diego Chapter — Photograph by Phil Raney)

Tours Pacific Northwest Chapters

G. A. Groom (Center), Micromatic Hone Corp., Is Shown With W. J. Wakefield (Left), and L. J. Chockie, Technical Chairman, Both of General Electric Co., at the Columbia Basin Chapter During His Northwest Chapter Tour

Speaker: G. A. Groom

Micromatic Hone Corp.

G. "Andy" Groom, regional manager for the Micromatic Hone Corp., toured the **Pacific Northwest Chapters** to present an interesting talk on the "Development of Surface Finishes". The tour included visits to the Oregon, Puget Sound, British Columbia, Inland Empire and Columbia Basin Chapters, and was arranged by Charlie Cumming of the British Columbia Chapter.

Mr. Groom presented a discussion on the methods of generating surface finishes and surface characteristics by honing. His talk was illustrated with a sound movie, Progress in Precision, in which several examples of automatic precision honing were shown. He described the fast rate of removal obtainable by automatic honing of such materials as porcelain, titanium, steel, brass or aluminum. The possibilities of obtaining phenomenal tolerances, in the order of only 0.000080 in. clearance between cylinder and bore, were illustrated by using automatic machines in production setups.

The question and answer periods following the talks indicated interest by the audiences in such items as how spherical surfaces are generated, the types of abrasives for different materials and what effect various coolants have on the operation of the honing machines.—**Reported by W. V. Cummings of the Columbia Basin Chapter.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts*.

A General Metallurgy

466-A. Iron Ore for Britain's Steel. Eric Ford. *British Steelmaker,* v. 23, Sept. 1957, p. 270-271.

Tonnage tables of home ore supplies and imports for 1937, 1954-5-6. Discussion of potential sources for projected increase of 8-10 m. tons imported ore between now and 1962. (A4p; Fe, RM-n)

467-A. Seeking New Outlets. Cecil H. Chilton. *Chemical Engineering,* v. 64, Sept. 1957, p. 208-209.

Brief survey of nuclear uses, nonnuclear potential of zirconium, hafnium, beryllium and columbium; special properties of these metals; production figures in U. S. plants. (A4, 17-7; Zr, Hf, Be, Cb)

468-A. Occurrence of Selenium in Sulfides From Some Sedimentary Rocks of the Western United States. R. G. Coleman and Maryse Delevaux. *Economic Geology,* v. 52, Aug. 1957, p. 499-527.

Investigation of nature, amount and distribution of selenium, by means of selenium bearing sulphides, associated with uranium ore deposits of the Colorado Plateau and Wyoming. 33 ref. (A4n; Se)

469-A. A Plan for Establishing an Aluminum Industry Near Rihand Dam, Uttar Pradesh. Balram K. Mahenda. *Geological, Mining and Metallurgical Society of India, Bulletin,* no. 16, Mar. 1956, p. 1-32.

Geological description and characteristics of bauxite deposits of Amarkantuk Plateau; proposed quarrying methods and estimated costs; possible transport facilities; estimate of raw materials required and sources in India; hydro-electric power stations for supply of energy; proposed integrated plant at Annapur in central India; alternate proposal for aluminum reduction and fabrication plant near Rihand Dam site, with manufacture of alumina only at Annapur; estimated production costs for both plans. (A4, W10; Al)

470-A. On Certain Mines, Geological and Mining Institutions and Factories in Japan. B. C. Roy. *Geological, Mining and Metallurgical Society of India, Bulletin,* no. 18, Jan. 1957, p. 1-32.

Report of visits to Kamioka lead-zinc mines, Hitachi copper mine, geological and mining institutions of Tokyo University, government departments, miscellaneous plants; includes data on mineral reserves and production, mining operations, production figures for nonmetallic minerals, nonferrous metals, aluminum, iron, steel, machine tools and allied industries. (A11a, A4, B general)

471-A. Effect of Metal Finishing Wastes on Sewage Purification. A. E. J. Pettet. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 36-63.

Chief dangers of attack on sewers are from unneutralized acidity or from concentrations of neutral sulphates in excess of 1,000 ppm. SO_3. To avoid interference with treatment of sewage, chemical pretreatment of wastes is necessary, including neutralization, precipitation of metallic salts, reduction of chromic acid and removal of cyanides. 37 ref. (A8b, L17)

472-A. New Titanium Sheet and Bar Alloys. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 157, 159. (CMA)

Two new titanium alloys with strength, formability and high-temperature creep resistance. Ti-16V-2.5Al is a sheet alloy which is soft and formable in the solution treated condition and can be age hardened to high strength with usable ductility. Ti-8Al-2Cb-1Ta has less than 0.2% total plastic creep at 800° F. under 50,000 psi. and after 300 hr. (A4, Q general; Ti)

473-A. Science for Electroplaters. Pt. 29. Cyanide Disposal Methods. L. Serota. *Metal Finishing,* v. 55, Oct. 1957, p. 75-77, 79.

Survey of complexing agents and compounds for the conversion of cyanide in wastes to less toxic substances. (A8b, L17)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months. A schedule of the principal headings in the revised version was published in the February issue.

474-A. Engineering Research at East Kilbridge. R. J. F. Franklin. *Metal Industry,* v. 91, Sept. 27, 1957, p. 265-269.

Research at the Mechanical Engineering Research Laboratory of the British Department of Scientific and Industrial Research includes investigation of fatigue cracks, fatigue strength, creep, plastic deformation, the design of extrusion dies and the mechanism of heat transfer. 6 ref. (A9h, Q general)

475-A. What's in the Literature? Frank T. Sisco. *Metal Progress,* v. 72, Oct. 1957, p. 122-124.

Searching of metallurgical literature is now so costly in time of high-grade men that it is frequently cheaper to get a direct answer by laboratory research than to find out whether someone else has recorded his findings. It is hoped that machine searching of metallurgical literature will correct this situation, at least in the field of metals engineering. (A14e)

476-A. Progress in Magnesium. H. G. Warrington. *Metal Progress,* v. 72, Oct. 1957, p. 139-142.

Unlimited ore supplies, well-developed reduction and fabrication processes, light weight and other inherent advantages together with continually improved alloys, foreshadow enlarged consumption for all sorts of machinery in motion, for nuclear reactors, and for consumer goods. (A general, 17-7; Mg)

477-A. SRI Metals Lab: Industry Research Partner. Robert T. Reinhardt. *Western Metals,* v. 15, Sept. 1957, p. 71-72.

The contract research program and facilities at Stanford Metallurgical Laboratory. (A9h)

478-A. The Zinc Industry in Australia. *Castings,* v. 3, Sept. 1957, p. 5-11.

Activities of the Electrolytic Zinc Co. of Australasia Ltd. (A general; Zn)

479-A. Lithium Climbs Out of Obscurity. G. G. Carr. *Iron Age,* v. 180, Oct. 10, 1957, p. 80-81.

Possible applications of lithium in alloying. (A general; Li, 17-7)

480-A. What Metalworking Looks for in 2000. *Iron Age,* v. 180, Oct. 24, 1957, p. 161-164.

Probable technical developments in steelmaking, machine tools, automobiles, pressing and forming,

foundries and aluminum.
(A general)

481-A. Zirconium, Hafnium and Vanadium. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 111. (CMA)

Tabulated data for physical, mechanical, fabricating and corrosion resistant properties. Uses are noted as nuclear or AEC classified. Available forms. (A general; Zr, Hf, V)

482-A. Alloy Cast Irons Can Solve Tough Problems. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 140-144.

Various grades of corrosion resistant, heat resistant and special purpose gray cast irons with high silicon, nickel, chromium and copper alloying elements. Typical applications of each. 16 ref.
(A general; CI-q, 17-7)

483-A. Titanium. John L. Everhart. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 149-168.

Manual covering all commercial and semicommercial alloys now in production. Composition and properties, working characteristics, suggested heat treatments with current applications in aircraft, corrosion resistant equipment and electronics. 22 ref. (A general, 17-7; Ti)

484-A. Science for Electroplaters. Pt. 28. Treatment of Chromate Wastes. L. Serota. *Metal Finishing,* v. 55, Sept. 1957, p. 65-67, 71.

Treatment by reduction with barium sulphide, sodium bisulphite, ferrous sulphate, sulphur dioxide and chromate recovery by ion-exchange resins. (A8b, L17; Cr)

485-A. Vacuum Metallurgy. A. E. Williams. *Metal Industry,* v. 91, Sept. 20, 1957, p. 233-237.

High-vacuum processes for degassing, distillation, melting, metallizing, heat treating and powder metallurgy. Advantages of vacuum process for wide range of metal treatment. (A general, 1-23)

486-A. Rare Earth Metals; Their Properties and Industrial Application. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 421-424.

Compounds of rare earths with sulphur; alloys of rare earths; metallurgical applications; rare earths as alloying agents; use in steelmaking; elimination of impurities in the mass of the steel; industrial applications of rare earths.
(A general; EG-g, AD-n, 17-7)

487-A. The British Iron and Steel Research Association. *Metallurgia,* v. 56, Oct. 1957, p. 169-174.

Current research in ironmaking, steelmaking, metalworking, coatings, plant engineering and operations research. (A9h; Fe, ST)

488-A. The British Welding Research Association. *Metallurgia,* v. 56, Oct. 1957, p. 175-178.

Work in structural designs, brittle fracture, fatigue, pressure vessels, storage tanks, pipelines, resistance welding and nondestructive testing.
(A9h, K general)

489-A. British Non-Ferrous Metals Research Association. E. C. Mantle. *Metallurgia,* v. 56, Oct. 1957, p. 179-182, 188.

Current activity includes a projected study of thorium as a fuel in nuclear power stations; X-ray fluorescence analysis; analysis with ion exchange resins and high-strength light alloys.
(A9h; EG-c38)

490-A. The British Cast Iron Research Association. G. R. Woodward. *Metallurgia,* v. 56, Oct. 1957, p. 183-188.

Investigations include soundness of castings, mechanical properties, graphite formation, thermal shock and mold soundness, corrosion, gases in cast iron and foundry sands.
(A9h, E general)

491-A. The British Steel Castings Research Association. A. H. Sully. *Metallurgia,* v. 56, Oct. 1957, p. 189-192.

Study of molding materials, steelmaking, foundry processes, properties of cast steel and the operation of foundry plant and equipment.
(A9h, E general; ST)

492-A. Indium in Industry. *Mining Journal,* v. 249, Sept. 20, 1957, p. 338-339.

History, occurrences, extraction, estimation, properties, uses.
(A general; In)

493-A. Grinding Wheels. G. Frank Loewy. *Modern Castings,* v. 32, Nov. 1957, p. 50-52.

Safety rules for grinding operations. (A7p, G18)

494-A. Trip to the Bureau of Mines, Albany, Ore., Regarding Rare Earth Alloy Development. C. F. Leitten, Jr. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-56-11-29, Nov. 5, 1956, 5 p. (CMA)

Discussions at a Bureau of Mines meeting on the development of lanthanon alloys. Steps for the refinement of lanthanons from their oxides, alloy preparation and fabrication. Gadolinium has so far been separated and alloyed with titanium, zirconium and stainless steels.
(A general, EG-g)

495-A. Welding Hazards: Our Modern-Day Mythology. T. B. Jefferson. *Welding Engineer,* v. 42, Oct. 1957, p. 39-41.

Facts about injurious metal fumes occasionally created during welding.
(A7, K general)

496-A. A New Look at High-Temperature Alloy Development. C. L. Hibert. *Western Machinery and Steel World,* v. 48, Sept. 1957, p. 119-122.

Suggests need for high-temperature alloys containing large amount of more abundant elements such as Si, Al, Fe, Mg or Ti.
(A general; SGA-h)

497-A. (German, French, Spanish, English.) **Abrasives in Metallurgy.** *Aciers Fins & Speciaux Francais,* no. 26, July 1957, p. 97-99.

Nature of abrasion phenomena and abrasives, their history and applications; aptitude of metal to abrasion and classification of uses of abrasives. (A general, NM-j)

498-A. (English.) **Production Problems of Titanium and Its Alloys. Pt. 2.** R. L. P. Berry and E. Swainson. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 17, July 1957, p. 108-112. (CMA)

Furnace developments needed for the future, physical and chemical aspects of scrap reclamation and present reclamation procedures, heating precautions, hot and cold working, extrusion, annealing, metal and alloy sheet production, descaling, welding, brazing, machining, improvements in titanium processing and production statistics for 1948-1958 (projected). (A general; Ti)

499-A. (French.) **Super Alloys and Cermets.** Jean A. Ternisien. *Technique Moderne,* v. 49, Aug. 1957, p. 444-447.

Properties of cermets compared with those of superalloys; types of cermets and their manufacture. 10 ref. (A general; SGA-h, 6-20)

500-A. (German.) **Welds and Castings.** Jules Kisler. *Giesserei-Praxis,* v. 75, Aug. 25, 1957, p. 356-359.

Technical and economic comparison of welded versus cast construction; examples of typical applications. (A general; 7-1, 5, 17-7)

501-A. (German.) **Historic Cast Iron Pipes.** Adalbert Wittmoser. *Giesserei,* v. 44, Sept. 26, 1957, p. 557-563.

Last 500 years of cast iron pipe fabrication; results of the tests on the materials used. 13 ref.
(A2; CI, 4-10)

502-A. (Italian.) **Safety Rules for Personnel Employed in the Production of Cast Iron.** *Fonderia,* v. 6, Aug. 1957, p. 361-369.

Rules of leading Italian manufacturer were worked out on basis of equipment and work cycle. Rules for blast furnace, loading, pig breaking, storing area, electric furnace, agglomeration operations.
(A7p, D1, Fe)

503-A. (Italian.) **Production, Properties and Uses of Super Pure Aluminum.** Eugenio Hugony. *Rivista di Ingegneria,* v. 7, Aug. 1957, p. 897-908.

Electrolytic and mercury processes, special processes employing catalytic distillation of aluminum in presence of halides; comparison of properties of super pure (99.996%) and pure (99.5%) Al. Use in manufacture of special alloys such as "Reflectal 0.5" and "Reflectal 20," containing respectively 0.5% and 2% Mg, and "Reflectal 74" containing 0.75% Mg plus 0.45% Si. Use in electrolytic condensers, reflectors, jewelry, household equipment, construction (where it provides high corrosion resistance), chemical apparatus, electric cable coverings. 21 ref.
(A general, 17-7; Al-a)

504-A. (Russian.) **Granulation of Manganese Slags.** D. S. Chikashua, A. I. Metreveli and O. I. Voitenko. *Stal',* v. 17, July 1957, p. 611-615.

Air and water-air granulation process for manganese slags. The water-air granulation process is recommended as certain materials otherwise considered a waste such as too fine grades of coke, lime and poor grade ore can be incorporated into the slag. 5 ref.
(A11d; RM-q, Mn)

505-A. (Spanish.) **Experience With and Methods Used in Switzerland in Examining Welding Operators.** C. G. Keel. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 8 p.

Examination consists of welding a plate in horizontal and vertical positions, plus 16 other supplementary tests, including oral. Between 1947 and 1956, 982 applicants were approved in Switzerland. Analysis of ages, trades of applicants, selection of tests, costs of examinations.
(A6m, K general)

506-A. (English.) **General Principles Governing the Choice of Materials.** N. P. Allen. *Teknisk Ukeblad,* v. 104, Sept. 12, 1957, p. 735-742.

From point of view of metallurgist, who provides the material rather than the man who only uses it. Material must be able to meet four requirements: availability, ability to be put into required form, ability to do required technical job, sufficient permanency to do job for economically long period.
(A general, 17-7)

507-A. (French.) **Improvements in Cermets and Recent Industrial Applications.** *Genie Civil,* v. 134, Sept. 15, 1957, p. 379-381.

Composition and properties of carbide, boride and aluminide-base cermets; physical properties of sintered alumina used in cutting tools; advantages of sintered alumina for cutting tools and special machining applications such as gears or transmission shafts for turbines. (A general, T6n, 17-7; 6-20)

508-A. (German.) **Strontium.** Fr. W. Landgraeber. *Chemiker Zeitung,* v. 81, Aug. 5, 1957, p. 498-501.

Use, physical and chemical properties, mining techniques and deposits. (A general; Sr)

509-A. (Book.) **Basic Metallurgy,** v. 2. G. William Zuspan. 232 p. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $7.50.

A laboratory text for use with volume 1 for the first two courses for beginning evening students. Metallurgical tests and heat treatment; typical headings are hardness testing, nondestructive testing, corrosion testing, heat treatment equipment. 7 ref. (A general, Q general, S general, R11, J general, 1-2)

510-A. (Book.) **Ductile Chromium.** 376 p., Aug. 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $7.50.

Proceedings of the 1955 Conference co-sponsored by the Office of Ordnance Research, U. S. Army, and the American Society for Metals. Extraction, fabrication and properties; research findings. (A general; Cr)

511-A. (Book.) **Glossary of Terms in Nuclear Science and Technology.** National Research Council. 180 p. 1957. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. $5.00.

Designed to provide a common language among medical men, engineers, chemists, physicists, biologists and others working with the atom, it includes three categories of terms; those invented expressly for the field of nuclear energy, those borrowed from other fields and employed here with different meanings, and those used elsewhere but which may be unfamiliar to nuclear workers. Definitions, tables, charts and formulas. (A general, P18; 11-17)

512-A. (Book.) **Engineering Metallurgy.** Committee on Metallurgy. 516 p. 1957. Pitman Publishing Corp., 2 W. 45th St., New York 36, N. Y. $7.50.

Forty professors present the principles of ferrous and nonferrous metallurgy for engineers—student and practicing. General principles of metallurgy, phase diagrams, heat treatment, machinability, corrosion and temperature effects. (A general)

513-A. (Book.) **Dangerous Properties of Industrial Materials.** N. Irving Sax. 140 p. 1957. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $22.50.

Revised and enlarged edition of "Handbook of Dangerous Materials". Safety reference for those involved in the manufacture, use, handling, storing or shipping of hazardous materials. Nuclear reactors and radiation are treated in separate chapters. (A7)

B Ore and Raw Material Preparation

114-B. Beneficiation of Low Grade Saskatchewan Uranium Ores. Pt. 4. L. W. Crawford, Brad Gunn, S. D. Cavers and A. B. Van Cleave. *Canadian Journal of Chemical Engineering,* v. 35, Oct. 1957, p. 99-104.

Low-grade pegmatitic ore containing uraninite can be upgraded by flotation by factor of 3.8 to 5.1 with U_3O_8 recoveries varying from 85 to 75%. Most satisfactory combination of reagents involves sodium hexametaphosphate as conditioner, sodium myristate or palmitate as collector and oleic acid as frother. Addition of conditioner and collector directly to ball mill charge decreases amount of frother required. 7 ref. (B14; U, RM-n)

115-B. Instrumentation for a Sintering Plant. A. A. Latowski. *Industrial Heating,* v. 24, Aug. 1957, p. 1584-1586, 1688.

Emphasizes importance of instrumentation for controlling feed characteristics, mechanical performance of sintering machine and furnace performance. (B16a, 1-2; Fe, RM-n)

116-B. Assessment of Flotation Results. J. C. Nixon. *Institution of Mining and Metallurgy, Bulletin,* no. 607, June 1957, p. 453-469.

A method for assessment of laboratory batch flotation results. Concentrates from flotation tests were taken off in several fractions and cumulative metal or mineral distributions therein graphed against cumulative percentage weights. Results from several similar tests were then approximated as straight lines, which enabled results to be assessed by simple statistical methods. Technique was applied to ores of lead-zinc, sulphide and oxide copper, copper-cobalt and fluorspar. 11 ref. (B14h, 1-4; Pb, Zn, Cu, Co)

117-B. Mixed Firing to Save Solid Fuel in Sintering. H. Rausch and K. Meyer. *Iron and Coal Trades Review,* v. 175, Aug. 16, 1957, p. 389-394.

Process for saving coke breeze in sintering by the combustion of liquid or solid fuel in a hood above the sinter strand. Sinters obtained are of good strength and reducibility, 3 ref. (B16a; Fe, RM-n)

118-B. Elimination of Sulphur and Other Elements During Sintering. B. G. Baldwin and L. F. Burgess. *Iron and Coal Trades Review,* v. 175, Aug. 23, 1957, p. 425-433.

Chemistry of sulphur removal; sulphur evolution during sintering; experiments and results of study on removal of water, carbon dioxide, phosphorus and sulphur, with primary interest centered on latter; conclusions. 12 ref. (B16a; Fe, *S,* RM-n)

119-B. Something New in Sintering. Harold E. Rowen, Patrick V. Gallagher and Thomas E. Ban. *Iron and Steel Engineer,* v. 79, Aug. 1957, p. 133-144.

Development and evolution of sintering in nonferrous and ferrous industries describing sintering machines from round pot to modern continuous equipment; considers heat exchange systems, feed, proportioning and preparation devices. (B16a, 1-2)

120-B. Depression of Pyrite by Cyanide Ions. K. K. Majundar. *Mining Magazine,* v. 97, Sept. 1957, p. 137-139.

Mechanism of depression of pyrite by alkali cyanide is discussed in relation to possible reactions of cyanide ions on pyrite during flotation. 9 ref. (B14h; Fe)

121-B. Dual Process Metallurgy Stretches Inspiration Ore Reserves. Stanley Dayton. *Mining World,* v. 19, Sept. 1957, p. 50-59.

Faced with problem of mining lower grade ore containing increasing proportion of sulphides, Inspiration Consolidated Copper Co. abandoned acid-ferric-sulphate leaching practice, switched to Dual Process, renovated idle concentrator, equipping it with new machinery for treating 15,000 tons of minus-¾ in. residue to implement flotation of sulphides. Details of process and equipment. (B14; Cu)

122-B. Nevada Mills Rewrite Cinnabar Flotation Textbook. Keith Kunze. *Mining World,* v. 19, Sept. 1957, p. 64-66.

Extensive laboratory pilot plant testing followed by commercial-scale application has proven that mercury flotation is useful recovery tool for certain types of ores; that information on mercury flotation in technical literature has been erroneous. Soda ash and sodium silicate have been previously specified as dispersion reagents for cinnabar ore; recent test work shows that these reagents are strong depressants for cinnabar and their use will result in poor recoveries. (B14h; Hg)

123-B. Review of Developments in the Sintering Process. M. F. Morgan. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1142-1144.

Chronological survey of design and operation of sintering plants. (B16a; Fe, RM-n)

124-B. Titaniferous Iron Sand Deposits of the Muroran Mine, Hokkaido. Takeo Bamba and Teruaki Igarashi. *Geological Survey of Japan, Bulletin,* v. 7, Dec. 1956, p. 55-59. (CMA)

Illmenite-bearing magnetite is concentrated in some of the diluvial sediments on the end of Muroran peninsula. Some of the placer deposits have been worked by Hokkaido Industrial Co. Ltd. Ore grade averages 15% iron and 2% TiO_2. (B14; Ti, RM-n)

125-B. Effect of Roasting on Recovery of Uranium and Vanadium From Carnotite Ores by Carbonate Leaching. J. Halpern, F. A. Forward and A. H. Ross. *Mining Engineering,* v. 9, Oct. 1957, p. 1129-1134. (CMA)

Effect of roasting carnotite ores in presence of various reagents on subsequent recoveries of uranium and vanadium by carbonate leaching. Roasting at temperatures of about 850° C. with calcium salts, including quick lime generally increased the vanadium extraction. 8 ref. (B15, C19n; U, V)

126-B. (English.) **Study of the Mechanism and Kinetics of Oxidation of Green Magnetite Pellets.** J. O. Edstrom. *Jernkontorets Annaler,* v. 141, Aug. 1957, p. 457-478.

Reaction mechanism; quantitative expressions for rates of oxidation in pure oxygen and in a mixture of oxygen and inert gases; application to shaft furnaces. 27 ref. (B16b, D8; Fe)

127-B. (French.) **Blast Furnaces, Preparation of Blast Furnace Charges. Study of Sintering of Ore**

Fines and Blast Furnace Dust. Andre Mercier. *Technique Moderne,* v. 49, July 1957, p. 301-309.

Processing of mix components, handling and storing of blast furnace dust, mixing of raw materials; equipment used in Greenwalt and Dwight-Lloyd sintering processes, exhaust systems and cooling of sintered products; rotary furnace processes. (B16a; Fe)

128-B. (French.) **Crushing and Screening of Ore Fines.** R. Godiniaux. *Technique Moderne,* v. 49, July 1957, p. 310-314.

Necessity and advantages of precrushing; principal types of crushers and screens; choice of crushers; crushing and screening installation at Hayange (Moselle) mine; granulometry of crushed products and use of screened material from this installation. (B13, 1-2; RM-n)

129-B. (Russian.) **Problems of Sintering.** L. I. Kharash, M. I. Shinyakov and S. I. Eliasberg. *Stal',* v. 17, Feb. 1957, p. 106-114.

Various aspects of sintering iron ores. Experimental results show that fluxed sinters give best results in the blast furnace. It is recommended that the sintering surfaces in new machines should not be less than 200 sq. m. 6 ref.
(B16a; Fe)

130-B. (Russian.) **Improving the Grain Condition of the Krivoy Rog Sintered Ore.** M. I. Kostyuk, S. K. Grebnev, A. A. Aksenov, P. E. Ostapenko and M. A. Simacheva. *Stal',* v. 17, Feb. 1957, p. 114-118.

Experimental electrically heated screens increased agglomerated ore size from 5-6 mm. to 10-80 mm. in preparation for delivery to the sintering section. This new method is expected not only to raise the capacity of the screens but also to better working conditions.
(B14m, B16a; Fe)

131-B. (French.) **Oxidation Reactions of Some Sulphide Ores.** M. Lefevre, J. Lemmerling and A. Van Tiggelen. *Chimie et Industrie,* v. 78, Aug. 1957, p. 107-114.

Oxidation of some sulphide ores (blende, bornite and chalcopyrite) studied by a manometric method in a low-temperature domain (200-300° C.). Reaction consists primarily of a direct sulphation in which the speed-controlling phase is activated adsorption of oxygen. Activation energy of adsorption was measured. Oxidation at higher temperatures (up to 800° C.) was studied by thermogravimetry. Above 400° C., a number of simultaneous and competing reactions are produced which result in formation of sulphates and oxides. (B15n; RM-n)

132-B. (French.) **Combined Production of Manganese Oxide Concentrates and Fertilizers.** A. Baniel, R. Blumberg, E. J. Cejtlin, F. Grynbaum and O. Schacter. *Chimie et Industrie,* v. 78, Aug. 1957, p. 115-120.

Disadvantages of known hydrometallurgical methods for treatment of low-grade Mn ores. Method proposed which begins with leaching of ore sulphur dioxide. Sulphate ion obtained is utilized for production of potassium or ammonium sulphate. Method is example of linking of a metallurgical and another heavy industry, thus achieving more complete utilization of products employed in leaching. 15 ref.
(B14, A11c; Mn, RM-n)

133-B. (Italian.) **Magnetic Processing at the San Leone Iron Ore Mine.** Mario Giusti. *Industria Mineraria,* v. 8, July 1957, p. 479-485.

Equipment and processes in modern beneficiation plant installed by Societa Mineraria e Siderurgica "Ferromin". Dry electromagnetic separation capacity is 100 tons per hr.; wet, 70 tons per hr. Layout drawings, flow sheet.
(B14j, 1-2; Fe, RM-n)

134-B. (Book.) **Iron Ore Beneficiation.** Lawrence A. Roe. 305 p. 1957. Minerals Publishing Co., P.O. Box 85, Lake Bluff, Ill. $5.

Reference work for beneficiation engineers; history and economics of iron mining, iron ore minerals, beneficiation processes.
(B12, B13, B14; Fe, RM-n)

C Extraction and Refining

302-C. The Preparation of Tungsten Carbide. Arthur E. Newkirk and Ifigenia Aliferis. *American Chemical Society, Journal,* v. 79, Sept. 5, 1957, p. 4629-4631.

Tungsten carbide, WC, may be prepared by heating tungstic acid, a blue oxide of tungsten or ammonium paratungstate in a mixture of hydrogen and methane at 850-1000°. With tungstic acid, reduction to tungsten metal is shown to be complete before carburization begins. 8 ref. (C19, W, *C,* 6-19)

303-C. Pressure Leaching of Montana Nickel-Copper Concentrates. G. V. Cullen. *Chemical Engineering and Mining Review,* v. 49, Aug. 15, 1957, p. 48-51.

Resemblance between ore at Zeehan and Lynn Lake; preliminary pressure leaching tests using ammoniacal solutions. 6 ref.
(C19n; Ni, Cu)

304-C. Some Aspects of Reactor Material Technology. Pt. 2. Role of Ion Exchange and Solvent Extraction. John S. Carr. *Chemical Engineering and Mining Review,* v. 49, Aug. 15, 1957, p. 52-57.

Chemical and metallurgical factors in aqueous processes for production, recovery and purification of reactor fuel; ion exchange in recovery of uranium from its ores; solvent extraction for large scale treatment of irradiated reactor fuel. 11 ref.
(C19, T11g; U)

305-C. Large Titanium Ingot Production. *Light Metals,* v. 20, Sept. 1957, p. 291-292. (CMA)

Ingots up to 20-in. diameter are produced which weigh one ton. Alloy development led to the production of five "Hylite" alloys, the most complex of which has good mechanical and creep strength up to 450-500° C. Melting operations (double) are described. (C5; Ti, 5-9)

306-C. Vacuum Induction Melting—Process Considerations. W. E. Jones. *Metal Progress,* v. 72, Oct. 1957, p. 133-138, 220.

Successful vacuum melting requires very high vacuums, leak-tight equipment, pure melting stock and crucible materials. Reactive metals added at the end of the heat then alloy with the melt rather than form undesirable inclusions. Notable improvements result in high-temperature properties of heat resistant alloys.
(C5, 1-23; SGA-h, Ni, Co, Fe, 5-9)

307-C. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 331-334.

Relationship between machining performance and chip formation, intermittent cutting, hardness. (To be concluded.) 24 ref. (G17k)

308-C. Extraction and Purification of Plutonium Metal. *Platinum Metals Review,* v. 1, Oct. 1957, p. 132-133.

Extraction of plutonium from irradiated uranium and its subsequent purification at the Windscale Works of the United Kingdom Atomic Energy Authority. (C19; Pu)

309-C. Niobium Refined. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 48-50.

Cage zone melting. (C28k; Cb)

310-C. New Smelting Technique Uses Blast Furnace to Recover Zinc and Lead. S. W. K. Morgan. *Mining World,* v. 19, Oct. 1957, p. 58-63.

Direct smelting to liquid zinc treats both zinc and mixed sulphide ores and concentrates to yield metallic zinc. Lead content of charge, as well as silver, gold, antimony and small amounts of copper, are simultaneously recovered as lead bullion. Copper, when present in appreciable amount, is recovered as matte, whether lead is being tapped or not. Zinc recovery as a metal is 89% of zinc volatilized; remaining zinc is periodically recovered in dross and blue powder. Charge free from fines is essential; sinter has proven satisfactory.
(C21a; Zn, Pb)

311-C. How Mitsubishi Uses Automatic Furnace Control at Naoshima Copper Smelter. Sei Arakane. *Mining World,* v. 19, Oct. 1957, p. 73-78.

Features of smelter equipped with only copper reverberatory furnace in Orient; heat, fuel, combustion control systems; problems of maintenance of furnace and its roof; installation of horizontal suspended roof; zinc fuming copper slag.
(C21, W18r, 1-2; Cu)

312-C. Zirconium Ingots Arc Melted From Various Types of Zirconium Scrap. E. S. Foster and W. J. Hurford. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-96, Nov. 13, 1951, 7 p. (CMA)

Ingots were arc melted from such zirconium scrap as machining chips, turnings, hot rolled strip tailings and "picture frame" cores. Ingots melted satisfactorily with regard to cleanliness and splatter. The hardness of the ingots comes from contamination in the scrap.
(C5h, A11d; Zr, RM-p)

313-C. Development of a Method for Consumable Arc Melting Crystal Bar Hafnium. J. G. Goodwin and W. J. Hurford. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-216, Jan. 8, 1954, 18 p. (CMA)

Three approaches to melting hafnium were studied, of which the Bureau of Mines and WAPD approaches were consumable arc melting. Advantages and disadvantages of each. It is recommended that a method be devised to eliminate non-consumable melting, and that double length hafnium ingots be melted. 4 ref. (C5h; Hf)

314-C. Preliminary Process Specification for Melting Uranium-12 Molybdenum Alloy. F. R. Lorenz. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,*

WAPD-FE-681, Mar. 1, 1955, 5 p. (CMA)

Specifications for the vacuum induction melting and consumable remelting of U-12Mo. Furnaces and other equipment specified are described. The vacuum induction cast electrode is pickled in nitric acid solution, threaded onto the electrode lead, and is arc-melted to an ingot in the presence of a helium-argon mixture. (C5j, 1-23, C5h; U, *Mo*)

315-C. Solvent Extraction Equilibria for Rare Earth Nitrate-Tributyl Phosphate Systems. L. L. Knapp, Morton Smutz and F. H. Spedding. Iowa State College. *U. S. Atomic Energy Commission,* ISC-766, Aug. 1957, 39 p. (CMA)

Effects on the equilibrium data of the TBP-lanthanon nitrate system of such process variables as concentration of acid and lanthanons. Distribution data were obtained for individual lanthanons in systems containing no nitric acid or salting-out agents. 19 ref. (C19; EG-g)

316-C. Physical Chemistry of NaCl-KCl Melts Containing Dissolved Titanium Chlorides. W. C. Kreye, et al. Columbia University, School of Mines, Report Under Contract N onr-266(24). *U. S. Office of Technical Services,* PB 125907. June 1956, 49 p. (CMA)

The equilibrium among titanium, $TiCl_3$ in NaCl-KCl melts and titanium and $TiCl_4$ alone in these melts were studied. Much of the work was in establishing analytical procedures for titanium chlorides in the melt. (Clp; Ti)

317-C. (German.) **Metallurgy of Titanium.** Paul Ehrlich. *Chemie-Ingenieur-Technik,* v. 29, Sept. 1957, p. 557-562. (CMA)

Reduction of titanium tetrachloride (Kroll process and reduction by sodium), the thermal dissociation and rearrangement of halides, and fusion electrolysis (electrolysis of oxides, of halides and with soluble anodes). 52 ref. (Clp; Ti)

318-C. (German.) **Flin Flon Copper-Zinc Mine (Canada).** Reinhard Kleinert. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 47, Aug. 1957, p. 383-391.

Description of deposits; copper leaching plant and furnaces; zinc concentration and refining; cadmium treatment. (C19, C general; Cu, Zn, Cd)

319-C. (German.) **Application of Pressure Extraction on Ores and Intermediate Products.** Franz Pawlek and Hartmut Pietsch. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Aug. 1957, p. 373-383.

Kinetics of oxidation pressure extraction examined for copper-nickel charges. In a neutral atmosphere pressure oxidation can produce elementary sulphur from sulphides. Method could be applied to zinc-sulphate solutions, and to various zinc concentrates and ores with up to 80% yield of zinc. 16 ref. (C19; Cu, Ni, RM-n)

320-C. (Russian.) **Effect of Vanadium on the Solubility of Oxygen in Iron-Carbon Melts.** R. A. Karasev, A. Y. Polyakov and A. M. Samarin. *Akademiya Nauk S.S.S.R., Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 146-150. (CMA)

With a view to establishing optimum conditions for the extraction of vanadium during the treatment in a converter of iron-carbon melts rich in vanadium, a series of experimental treatments were made which demonstrated the essential difference between the slow oxidation of the metal surface in air and the process taking place in the converter under the action of the blast. (C21; V, Fe)

321-C. (Russian.) **Extraction of Vanadium From Blast Furnace Pig Iron With High Phosphorus Content.** A. Yu. Polyakov and A. M. Samarin. *Akademiya Nauk S.S.S.R., Izvestiya Otdelenie Tekhnicheskikh Nauk,* no. 6, June 1957, p. 18-26. (CMA)

Blast experiments in magnesite crucibles covering conditions governing the devanadizing of iron from ores with a high phosphorus content showed that it is possible to obtain viscous slags with at least 3.5% V from liquid iron with 0.068% V (and 1.906% P). The process, lasting 20-35 min. (the duration increasing with vanadium content in the initial material), was conducted at the relatively low temperature of 1150-1250° C.) (C21; V, RM-q)

322-C. (Russian.) **Preparation of Molybdenum Disilicide by Reduction of Oxides With Carbon.** L. Ya. Markovskii and N. V. Vekshina. *Zhurnal Neorganicheskoi Khimii,* v. 2, July 1957, p. 1694-1696. (CMA)

At stoichiometric proportions of the components the reaction $MoO_3 + 2SiO_2 + 7C \rightarrow MoSi_2 + 7CO$ leads to the formation of side products like Mo_5Si_3 and SiC, while some carbon remains unused. However, it was possible to develop a satisfactory procedure for preparing $MoSi_2$ by introducing an excess of SiO_2 and heating to 1900° C. 8 ref. (C19; Mo, *Si*)

323-C. (French.) **Separation of Some Rare Earth Elements by the Dry Method. Case of Samarium and Europium.** J. C. Achard. *Comptes Rendus,* v. 245, Sept. 23, 1957, p. 1064-1066. (CMA)

Samarium and europium are separated from other lanthanons by reacting carbon with a mixture of oxides at high temperature and low pressure. 5 ref. (C28; Sa, Eu)

324-C. (Italian.) **Molybdenum in Some Italian Zinc Blendes and in the Process of Electrolytic Extraction of Zinc.** Giovanni Scacciati. *Chimica e l'Industria,* v. 38, May 1956, p. 393-397.

Cycle of electrolytic extraction of zinc was studied in connection with two blendes having different proportions of molybdenum. Behavior and influence of molybdenum in precipitation of zinc from calcined blende, cementation of cadmium with zinc powder, electrolytic deposition of zinc, recovery of cadmium. 9 ref. (C23n, 2-10; Zn, *Mo*)

325-C. (Russian.) **Interaction Between Titanium Tetrachloride and Chlorides of Tantalum, Columbium and Aluminum.** I. S. Morozov and D. Ya. Toptygin. *Zhurnal Neorganicheskoi Khimii,* v. 2., Aug. 1957, p. 1915-1921. (CMA)

Chlorides of Ta, Cb and Al are obtained during the preparation of titanium tetrachloride from some titanium ores. Mutual solubility of these chlorides is examined. 7 ref. (Clp, P12e; Ti)

326-C. (Russian.) **Solubility of Ferric Chloride, and of Its Melts With Chlorides of Columbium, Aluminum and Sodium, in Titanium Tetrachloride.** I. S. Morozov and D. Ya. Toptygin. *Zhurnal Neorganicheskoi Khimii,* v. 2, Sept. 1957, p. 2129-2135. (CMA)

Industrial preparation of $TiCl_4$ from the rare-earth-containing varieties of titanium ores involves separation of titanium tatrachloride from chlorides of Fe, Al and Cb. Furthermore, mixtures of $FeCl_3$ and NaCl are used for removing $FeCl_3$ from $TiCl_4$. Systems composed of these chlorides are investigated with the aid of thermal analysis. (Clp; Ti)

D Iron and Steelmaking

309-D. The Changing Openhearth Picture. Kenneth C. McCutcheon. *Industrial Heating,* v. 24, Aug. 1957, p. 1571-1580.

Data comparing size of heats, productivity for different furnace sizes, firing rate and other changes in openhearth practice between 1947 and 1956. (D2; ST)

310-D. New Hot Top Cuts Ingot Discard in Half. William Czygan. *Iron Age,* v. 180, Sept. 12, 1957, p. 123-126.

Vallak, the Swedish developed hot top, keeps steel in feeder head molten long enough to prevent shrinkage cavities in piping. Heat produced by combustion of carbonaceous material in hot top. Sand or other refractory coatings prevent contamination of steel by hot top. (D9k, 1-2; ST)

311-D. The 48th BISRA Steelmaking Conference. Pt. 2. Recent Developments in Openhearth Practice Abroad and at Home. *Iron and Coal Trades Review,* v. 174, Sept. 20, 1957, p. 685-690.

Highlights of papers and discussion at 2nd of three sessions of conference held by British Iron and Steel Research Assoc. at Ashorne Hill on May 8, 9, 1957. Covers flush slag practice, use of cupola, developments in Germany and Russia, practice at modern British plants, —all as related to increased productivity in openhearth steelmaking. (D2; ST)

312-D. Fuel's Contribution to Increased Openhearth Capacity. C. W. Dunn. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 57-64.

Arrangement of openhearth furnace, types of burners, handling of fuel oil, layout of instruments and control panel for following combustion variables. Study of fuel rate, air rate, steam rate, furnace pressure, roof temperature, oxygen and waste gas temperature, in achievement of good furnace performance. (D2, 1-2; ST)

313-D. Increasing Openhearth Capacity by Extending the Hearth. Charles D. Guth. *Iron and Steel Engineer,* v. 79, Sept. 1957, p. 64-69.

Case history of hearth extension increasing openhearth furnace capacity. (D2, 1-2)

314-D. Increasing the Capacity of an Openhearth Shop. M. K. Morris. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 69-72.

Openhearth capacity increased by adding 3 in. of bath depth in furnaces and extending auxiliary facilities. (D2, 1-2)

315-D. Economics of the New Iron Ore Reduction Processes. E. C. Wright. *Metal Progress,* v. 72, Oct. 1957, p. 99-104.

A ton of steel from all direct iron processes requires at least 4,000,000 Btu. more energy than from the conventional blast furnace and openhearth, and consequently a direct iron plant must be located where electricity or gas is very cheap and coke is very dear. There is little difference in capital costs per ton of product per year.
(D8, B15; Fe, RM-n)

316-D. On the Basic Pneumatic Processes of Steelmaking. P. Coheur and H. Kosmider. *Blast Furnace and Steel Plant,* v. 45, Oct. 1957, p. 1131-1139.

Tests undertaken on ductility and weldability of steel made by pneumatic processes indicate that basic converter steel is as good as openhearth steel. 62 ref.
(D3, 1-15, Q23p, K9s; ST)

317-D. Trends in Electrification and Automation of Iron and Steel Processes. W. E. Miller. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 83-94.

Process and electric system relationship is analyzed. A basic automated process includes regulating systems, automatic inspection, automatic data logging, automatic data processing, programming, computing and reprogramming.
(D general, 18-24)

318-D. Vacuum Stream Degassing Is New Tool for Steel Plant Engineers. K. C. Taylor. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 142-144.

Vacuum pouring is the most economical and dependable way to reduce and control gaseous inclusions in steel. Improvements which degassing achieves in the physical properties of steel. (D9s, 1-23; ST)

319-D. Lithium-Based Grease Reduces Blast Furnace Lubrication Costs. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 162-164.
(D1; NM-h, Li)

320-D. Studies on Ingot Feeder Heads. H. S. Marr, G. Fenton and W. H. Glaisher. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 81-92.

Methods of increasing efficiency of feeder heads for killed steel ingots. Hot top lining needs to have low heat capacity to give high efficiency. Recommendations for improving yields from hot topped ingots. (D9, W19c; ST)

321-D. Similarity Criteria for Dust-Deposition Tests in Models. R. A. Granville, L. Sigalla and Hope Lubanska. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 121-125.

Application to the conduct and interpretation of openhearth furnace dust deposition and flow-visualization tests. 9 ref. (D2, A8a)

322-D. Economics of Continuous Casting in a Converter Steel Plant. J. Savage and J. S. Morton. *Journal of Metals,* v. 9, Aug. 1957, p. 1052-1056.

Process is particularly suitable for integration with converter and electric-arc furnace steelmaking. Capital and operating costs; comparison of costs between this method and conventional practice. 9 ref.
(D9q; ST)

323-D. Continuous Casting of Three Types of Low-Carbon Steel. F. G. Jaicks, L. E. Kraay and M. Tenenbaum. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, Aug. 1957, p. 1057-1072.

Experimental studies carried out at Inland Steel utilized a Rossi-type plant with a Junghans reciprocating mold system. Casting facilities, types of steel used, general sequence of casting plant operations and plant capacity. 20 ref. (D9q; CN-g)

324-D. (French.) **Chronicle of Steel Making: Iron Ore Reduction Processes.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3507, Aug. 1957, p. 458-460.

Brief summary of reduction principles and phenomena; types of furnaces used in fusion processes; processes not utilizing fusion and equipment used. (D general; RM-n, Fe)

325-D. (French.) **Rationalization of the Thomas Process.** J. Marot. *Silicates Industriels,* v. 22, Sept. 1957, p. 468-474.

Research undertaken at Hainaut Section of National Center for Metallurgical Research envisages improved process control and better understanding of metallurgical process of conversion. Problems encountered and results obtained to date. 15 ref. (D2)

326-D. (French.) **Development of Capacity of Martin Furnaces in France.** M. Mallevialle. *Technique Moderne,* v. 49, July 1957, p. 335-338.

Martin furnace operating conditions in France are not favorable for development of capacities comparable to those of American or Russian furnaces. Even when heating power can be obtained by use of rich fuels, or reinforced by use of oxygen, charging speed becomes insufficient because quality of raw materials is inferior. It is thus not possible to use furnaces, even of average tonnage, to maximum of their possibilities. (D2; ST)

327-D. (Russian.) **Investigation of Heat Exchange and Reduction Processes Involved in Using Fluxed Sinters in Blast Furnaces.** N. N. Babrykin and F. A. Yushin. *Stal',* v. 17, Jan. 1957, p. 7-15.

By changing from the usual agglomerate to hot, fluxed sinters with practically complete elimination of raw fluxes from the charge, blast furnace production was raised 12.2% and coke consumption reduced by 11.1%. (D1a; Fe, RM-q)

328-D. (Russian.) **Automatic Control of Blast Furnaces.** G. G. Pietrokovskii and F. V. Ashikhmin. *Stal',* v. 17, Jan. 1957, p. 16-20.

The operation and production of the Magnitogorsk Metallurgical Combine was considerably improved by introduction of automation. Such important functions of the furnaces as gas pressure, hot blast humidity and stove temperature are automatically controlled. (D1b, 18-24)

329-D. (Russian.) **Fluxed Sinters With Increased Magnesia Content.** A. I. Gamayurov and A. G. Neyasov. *Stal',* v. 17, Jan. 1957, p. 20-24.

Laboratory tests indicate that it is desirable to increase magnesia content in fluxed sinters of sulphorous ores to promote their reducibility. 5 ref. (D1a, B16a; Fe)

330-D. (Russian.) **Hydrodynamics of Liquid Steel in Molds.** A. A. Zborovskii, L. K. Strelkov, M. K. Skulskii and E. I. Rabinovich. *Stal',* v. 17, Jan. 1957, p. 24-30.

Investigations by radioactive tracers indicate turbulence during the process of solidification. Flow patterns in rimming and killed steels have different directions. 6 ref.
(D9k, 1-4; ST)

331-D. (Russian.) **Investigation of Liquid Steel Temperatures.** D. K. Pugachev. *Stal',* v. 17, Jan. 1957, p. 30-34.

By using immersion thermocouples the most favorable temperature in a massive openhearth heat before deoxidation was determined. This enabled the pouring of a larger quantity of better ingots.
(D2c, X9q, 1-2; ST)

332-D. (Russian.) **Influence of Technological Factors on Contamination of ShX15 Steel.** M. I. Zuev, D. P. Zhuravskii, M. I. Vinograd and M. A. Lyubinskaya. *Stal',* v. 17, Jan. 1957, p. 43-47.

Oxide inclusions can be held to a minimum if the brick lining of the furnace is sound; if the ladle temperature is held between 1530-1580° C., if the steel is poured from the bottom of the ladle to fill the mold in 80-100 sec.
(D2; ST, 9-19)

333-D. (Russian.) **How Deoxidation With Aluminum Affects the Quality of Constructional Steel.** N. G. Antropova, Z. M. Kalinina and A. K. Petrov. *Stal',* v. 17, Jan. 1957, p. 64-69.

Unconsumed aluminum which is added to the steel for final deoxidation forms nitride films at the grain boundaries. These influence the ductility, texture of fracture and other properties of the rolled steel. 9 ref. (D11r; ST, *Al,* AD-r)

334-D. (Russian.) **Smelting of Fluxed Sinters of Krivoy Rog Ore in the Blast Furnace.** I. V. Raspopov, Ya. P. Kulikov, Ya. S. Gorbanev and G. D. Muguev. *Stal',* v. 17, Feb. 1957, p. 99-103.

The use of ordinary sintered ore in place of fluxed sinters reduced coke consumption by 16%, and the cost of metal production by 10% with accompanying minimization of fuel dust losses.
(D1a, B16a; Fe, RM-n)

335-D. (Russian.) **Ferro-Coke and Ore-Coal Briquettes.** M. S. Kurchatov. *Stal',* v. 17, Feb. 1957, p. 103-105.

Thermostability tests in reducing atmosphere have shown the superiority of ore-coal briquettes over those of ferro-coke. The ore-coal ratio is in accordance with requirements for reduction. 6 ref.
(D1a; Fe)

336-D. (Russian.) **Character of Openhearth Steels Produced With Oxygen.** D. S. Kazarnovskii, T. M. Ravitskaya, M. P. Sidelkovskii and L. P. Tarasova. *Stal',* v. 17, Feb. 1957, p. 152-157.

Use of oxygen does not adversely affect the physical properties of rail steel or the quantity of gaseous and nonmetallic inclusions.
(D2q; Q general, ST-e)

337-D. (Russian.) **Remelting of High-Manganese Steel in the Openhearth.** P. T. Khokhlov. *Stal',* v. 17, Feb. 1957, p. 179-181.

New methods of melting high-manganese steel scrap result in a

saving of manganese and a product relatively free from hot cracks. (D2; ST, *Mn*, RM-p)

338-D. (Russian.) **Prospects of Pig Iron Production in Electric Furnaces.** A. G. Gerasimov. *Stal'*, v. 17, July 1957, p. 577-579.

Excessive electric power demand of pig iron production in electric furnace due to high conductivity of the ore is the main limiting factor of the wider application of the process. Results of the process carried out in 250 and 5500-kw. furnaces. 6 ref. (D8n, Fe, RM-n)

339-D. (Russian.) **Ferromanganese Smelting in a Large Blast Furnace.** A. F. Zakharov, F. A. Khilkevich, S. V. Brazilevich and B. L. Lazarev. *Stal'*, v. 17, July 1957, p. 580-584.

Details of ferromanganese smelting in a 1100-cu. m. blast furnace with high-temperature blast, slight oxygen enrichment (24.3%), high pressure of gases (0.5 atm.) and acidic slags (SiO_2, Al_2O_3-45%). The process allows a comparatively high utilization of manganese and insures good coke consumption rate. 5 ref. (D1; Fe, Mn, AD-n)

340-D. (Russian.) **Increase of Metal Output by Heating of Ingot Heads.** N. P. Zhetvin, A. A. Lebedkov, V. P. Tunkov and A. D. Zaitseva. *Stal'*, v. 17, July 1957, p. 587-592.

Method of intensive heating of ingot and shaped cast iron hot tops. The process reduces the weight of ingot heads. (D9; ST)

341-D. (Russian.) **Analog and Regulating Computers for Electric Arc Steel Furnaces.** Yu. E. Efroimovich. *Stal'*, v. 17, July 1957, p. 602-608.

Influence of the useful power and short grid parameters variation upon efficiency of the electric-arc furnace. Perfection of the electric-arc furnace process by application of analog computers in control of the electric parameters. (D5, X14j, 1-2)

342-D. (Russian.) **Automatic Control of Complex Mixtures Combustion in Metallurgical Plants.** A. Ya. Lerner. *Stal'*, v. 17, July 1957, p. 651-655.

Application of automatic computing devices in control of combustion of gases where the quantities of the components are measured by induction or rheostat transducers. (D11j, X14, 1-2)

343-D. (German.) **Dephosphorization Before the Decarburization During the Refining of Pig Iron by Pure Oxygen.** Hans Kosmider, Herbert Neuhaus and Hermann Schenck. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1277-1283.

Blowing methods; dephosphorization by indirect oxidation in the slag phase (buffer slag-oxidation process); characteristics of the process include desulphurization and prevention of the formation of brown waste gases. 9 ref. (D10, D11r; ST)

344-D. (German.) **Refining Basic Bessemer Pig Iron by Blowing With Pure Oxygen.** Friedrich A. Springorum, Karl G. Speith, Otto Darmann and Hans vom Ende. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1284-1296.

Plant operation and production of salable steel by blowing pure oxygen onto basic bessemer pig iron; blowing, dephosphorization and resultant alteration of carbon, silicon, manganese and nitrogen content; ore or scrap addition; relationship between phosphorus content of the bath, the iron content of the slag and temperature; and effect of carbon content; slag and waste gas composition; wear on the converter and life of refractory lining. 17 ref. (D3f; ST)

345-D. (German.) **Oxygen Refining of Pig Iron Rich in Phosphorus.** Heinrich Rellermeyer, Helmut Knuppel and Johann Sittard. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1296-1303.

Refining in the L-D converter; dephosphorization; top blowing; blowing with one or three oxygen lances; simultaneous blowing from the bottom; top blowing with simultaneous hot metal pouring. 12 ref. (D10a; ST)

346-D. (German.) **Mechanism of Top Blowing.** Rudolf Hammer, Theo Kootz and Johann Sittard. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1303-1308.

Action of the free jet of oxygen-bearing gases on the surface of a fluid; entrainment of liquid drops by the deflected jet; power and power losses of the jet. 7 ref. (D10a; ST)

347-D. (German.) **Refining With Oxygen in the Rotary Furnace by the Kaldo Process.** Bo Kalling and Folke Johansson. *Stahl und Eisen*, v. 77, Sept. 19, 1957, p. 1308-1315.

Description of first large plant at Domnarvet; development of process; reactions with basic bessemer pig iron and pig iron poor in phosphorus; life of the lining, heat economy, quality of the steel. 4 ref. (D10a; ST)

348-D. (Book.) **Manufacture of Iron and Steel. V. 1. Iron Production.** Reginald Bashforth. 306 p. 1957. Chapman & Hall Ltd., London W.C. 2, England. $7.

Survey of modern methods of manufacture of ferro-alloys, special irons and wrought irons. Blast furnace and other methods of pig iron production are covered. (D general; ST, CI-a)

E Foundry

527-E. **Which Core Process?** *Australasian Manufacturer*, v. 42, Aug. 17, 1957, p. 56-60.

Advantages and disadvantages of conventional, shell, gas-setting and air-setting core processes. (E21)

528-E. **Defects in Cast Iron for Enamelling Purposes.** *Foundry Trade Journal*, v. 103, Sept. 26, 1957, p. 363-366.

Effect of casting quality on the vitreous enameling process. Some of the defects that influence the quality of the final coating, such as variation in wall thickness and structure, together with spalling and porosity. (E25, L27; CI)

529-E. **Sealing Core Boxes Against Blow-By.** Richard L. Olson. *Modern Castings*, v. 32, Oct. 1957, p. 41-52.

Possible solutions for the problem of erosion damage. Advantages of sealed core boxes include prolonged core box life, elimination of core box facing and repair and less mudding, patching and finning of cores. (E21)

530-E. **Metallurgical Factors Affecting Locomotive Castings.** W. Montgomery. *British Foundryman*, v. 50, Oct. 1957, p. 493-503.

Use of nondestructive testing in the investigation of flaws in steel castings; wearing properties of brake shoes and cylinder liners; reclamation of iron castings by means of welding; self-hardening core oil based on tung oil and its application to core production. (E11, S13, A11d; ST)

531-E. **A Simple Review of Iron Foundry Costing.** G. B. Judd. *British Foundryman*, v. 50, Oct. 1957, p. 504-513.

Methods of estimating costs of patternmaking, molding, coremaking, fettling, cupola operation and defective castings. (E general; A4s)

532-E. **Mechanization of Gravity Dies.** Douglas Miller. *British Foundryman*, v. 50, Oct. 1957, p. 513-516.

Various means of actuating gravity dies and the advantages and disadvantages of electrical, hydraulic and compressed-air systems. (E13)

533-E. **Some Steelfoundry Mould and Core-Sand Mixes.** R. M. Chapman. *Foundry Trade Journal*, v. 103, Oct. 3, 1957, p. 395-398.

Cold setting core-sand binders; effect of the partial substitution of Wyoming bentonite by kaolinite; use of resin core binders. (E18n; ST)

534-E. **Tour of P. I. Castings (Altrincham), Ltd.** D. H. Armitage. *Foundry Trade Journal*, v. 103, Oct. 3, 1957, p. 399-406.

Investment-casting processes, including pattern production, investment, pouring and dressing operations. (E15)

535-E. **Refractory Chills — Experiments Carried Out at Carntyne Steel Castings, Ltd.** A. Scott. *Foundry Trade Journal*, v. 103, Oct. 3, 1957, p. 407-408.

Physical and thermal methods of obviating hot tearing. (E22r; ST, 5-10)

536-E. **Malleable Production at the Nacton Foundry of Ransomes, Sims & Jefferies, Ltd.** H. A. Wincer. *Foundry Trade Journal*, v. 103, Oct. 10, 1957, p. 423-431.

A step-by-step account of plant and equipment put to use by the firm for its initial venture into the production of malleable iron castings. (E11; CI-s)

537-E. **Mechanization for Shell Moulding.** *Foundry Trade Journal*, v. 103, Oct. 10, 1957, p. 433-437.

Progress made in South Africa in the development of the shell-molding process. (E16c, 18-24)

538-E. **Inoculation of High-Strength Grey Cast Iron.** N. C. McClure, A. U. Khan, D. D. McGrady and H. L. Womochel. *Foundry Trade Journal*, v. 103, Oct. 17, 1957, p. 453-460.

Series of experiments to determine the effect on mechanical and physical properties of gray cast iron when inoculated with silicon-containing alloys and other metals. Alloys and metals employed were ferrosilicon, calcium-silicon, manganese-zirconium-silicon and manganese-silicon with varying silicon contents. 3 ref. (E25q; CI-c, AD-p)

539-E. **Railway Engineering Equipment.** *Foundry Trade Journal*, v. 103, Oct. 17, 1957, p. 469-470.

Cast-steel bogies and automatic couplings at English Steel Castings Corp., Ltd. (E general, T23s, 17-7; ST)

540-E. **Meet the Electronic Sandman.** J. R. Young. *Modern Castings*, v. 32, Nov. 1957, p. 36-37.

Automatic control of sand moisture gives Cadillac foundry closer control of variables. (E18)

541-E. **Small Foundry Specializes and Grows.** Don Volk. *Modern Cast-*

ings, v. 32, Nov. 1957, p. 38-40.

Equipment, layout and growth record of Alloy Steel Casting Co. (E11, 1-2; AY)

542-E. Die Casting as It Is Being Applied and Developed in the Soviet Union. *Precision Metal Molding*, v. 15, Oct. 1957, p. 36.

Translation of a talk given at the Second International Die Casting Conference, recently held in Paris, by A. S. Ievsseiv, chief engineer, Foundry Section of the Institute of Research for the automobile industry. (E13)

543-E. Vacuum an Aid to Better Castings. Edward S. Czorniak. *Precision Metal Molding*, v. 15, Oct. 1957, p. 39-40, 65.

Universal Casting Corp. applies a vacuum to the mold cavity to produce close-grained, high-density castings free of porosity and inclusions. Unusual physical properties are attained without the sacrifice of intricate detail and close dimensional tolerances. (E19, 1-23)

544-E. Casting Big Engine Parts. *Precision Metal Molding*, v. 15, Nov. 1957, p. 44.

Large castings with complex coring can be cast by the permanent mold casting process. (E12; Al)

545-E. In Either Rain or Shine Die Castings Do the Job. Ralph Chappell. *Precision Metal Molding*, v. 15, Nov. 1957, p. 46.

Through the use of aluminum die castings low-priced instruments are now available for the amateur weatherman. (E13, X7, 17-7; Al)

546-E. Step Toward Automatic Die Casting. *Precision Metal Molding*, v. 15, Nov. 1957, p. 50-51.

With the development of an automatic transfer mechanism automation in the die casting foundry is one step closer. (E13, 18-24)

547-E. Heat Control of Investment Casting. S. C. Tingquist and William Cuddy. *Precision Metal Molding*, v. 15, Nov. 1957, p. 85-86.

Systems of temperature measurement and control for the more critical operations. (E15, S16)

548-E. Factors Affecting the Fluidity and Hot Cracking of Magnesium Alloys. H. F. Taylor and M. C. Flemings, Jr. Massachusetts Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131045, Jan. 1957, 93 p. $2.50.

Improvement of "castability" of magnesium alloys. A vacuum fluidity apparatus was used to determine fluidities of five alloys. Fluidity was determined as a function of temperature for each alloy, then fluidity at 1400° F. was plotted as a function of alloy content. (E25p; Mg)

549-E. (German.) **A New Process for the Improvement of Cast Aluminum-Silicon Alloys.** G. N. Cherry. *Giesserei-Praxis*, v. 75, July 10, 1957, p. 263-266.

By addition of sodium to molten aluminum-silicon, its mechanical properties are greatly improved. Vacuum treatment has eliminated difficulties formerly caused by water absorption of sodium. (E25, 1-23; Al, *Si*)

550-E. (German.) **Cement in the Foundry.** Karl Leisering. *Giesserei-Praxis*, v. 75, July 10, 1957, p. 266-267.

Cement used with small grain size sand results in great labor savings in molding due to easier insertion of cores. About three days must be allowed for setting of the cement in the mold before pouring. (E19, E18)

551-E. (German.) **Hydraulic Operated Chill Molds.** Ernst Brunhuber. *Giesserei-Praxis*, v. 75, Aug. 10, 1957, p. 324-326.

Hydraulic equipment, operation; advantages in labor, costs and quality. Chill mold casting is now up-to-date and of increasing importance. (E22r, 1-2)

552-E. (German.) **New Technique in Aluminum Melting.** H. Kalpers. *Giesserei-Praxis*, v. 75, Aug. 10, 1957, p. 345-346.

The gases dissolved in molten aluminum can be removed by chlorination; however, this process has disadvantages. To minimize them a supplementary treatment using nitrogen is advised. 6 ref. (E25s; Al)

553-E. (German.) **Calculation of Buoyancy.** R. Springer-Donawitz. *Giesserei-Praxis*, v. 75, Aug. 25, 1957, p. 351-353.

Formulas for calculating the upward force exerted by the liquid metal in a mold. (E25, E19)

554-E. (German.) **The Malleable Iron Foundry of the Georg Fischer AG at Schaffausen.** Walter Götz. *Giesserei*, v. 44, Sept. 26, 1957, p. 564-579.

Compression of the mold; withdrawal operation; mold boxes; pattern board; placing the mold boxes on the mold conveyer belt and closing the mold; casting operation; loading the mold before and after casting. 9 ref. (E11; CI-s)

555-E. (German.) **Roller Conveyer Systems in the Molding Shop.** Werner Riege. *Giesserei*, v. 44, Sept. 26, 1957, p. 612-616.

Range of application and advantages of the roller conveyer; design of molding machines and layout of shops. (E19, 1-2, W12r, 18-17)

556-E. (Italian.) **Proportioning of Gas in the CO_2 Process.** Rinaldo Cattaneo. *Fonderia*, v. 6, Aug. 1957, p. 341-343.

Formulas for determining required amounts of gas; color-changing binders and physicochemical bases for their use; utility of mechanical metering devices. (E18)

557-E. (Italian.) **The Foundry at Compagnia Italiana Westinghouse, Turin.** *Fonderia*, v. 6, Aug. 1957, p. 357-360.

Description, including schematic drawing, of foundry considered one of most modern and efficient in Italy. Specializes in intricate castings for brakes and pneumatic equipment in general; monthly production is 250,000 kg. of iron castings. (E general; CI)

558-E. (Russian.) **Influence of Vacuum and Overheating Upon Cast Iron Structure.** I. E. Brainin and S. I. Shapovalov. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 115-122.

Overheating of the liquid cast iron, remelting under vacuum and reduction of sulphur contents favor decrease of graphitic inclusions due to increase of surface tension on interface of liquid metal-graphite. 7 ref. (E25q, E10, 1-23; CI)

559-E. (German.) **Aluminum Casting in Automobile Industry.** Gerhard Schnitzlein. *Kraftfahrzeugtechnik*, v. 7, Aug. 1957, p. 303-304.

Practical advantages and disadvantages of three casting methods in production of automobiles including engines; surface treatment, chromium and nickel plating of castings. (E general, T21, 17-7; Al, *Cr*, *Ni*)

560-E. (Book.) **Cast Metals Handbook.** 320 p. American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $10.

Engineering reference book dealing with basic "know-how" in cast metals; working data for utilizing the properties of cast metals to the greatest engineering advantages. (E general)

561-E. (Book.) **Design of Die Castings.** Gustav Lieby. 199 p. 1957. American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $8. (Translation from the German.)

Methods and processing principles; features of die-cast products; die-casting materials and applications; suggestions for die design. (E13, 17-1; 5-11)

562-E. (Pamphlet.) **Investment Casting Engineering and Design Manual.** 50 p. 1957. Investment Casting Institute, 27 E. Monroe St., Chicago 3, Ill. $5.

Rules governing design; dimensional tolerances and shapes. Ferrous and nonferrous alloys recommended for the process. (E15, 17-1)

F Primary Mechanical Working

180-F. Aluminium Sheet and Strip Production. J. A. Richmond. *Metal Industry*, v. 91, Sept. 27, 1957, p. 259-264.

Casting shop, hot mills, cold mills, thin strip mills; coil finishing, plate and corrugated sheet production at the Falkirk plant of the British Aluminium Co., Ltd. (F23, W23, 1-2; Al)

181-F. Nickel and Nickel Alloys. A. B. Graham. *Metal Industry*, v. 91, Sept. 27, 1957, p. 275-278.

Extrusion of nickel alloys (Monel and Nimonic alloys); glass lubricants; vertical and horizontal presses; drawing and inspection techniques at Henry Wiggin Co., Ltd., Glasgow. (F24, G4; Ni)

182-F. Extrusion of Steel Using Glass as a Lubricant. Development of the Sejournet Process. Pt. 2. M. Jacques Sejournet. *Iron and Coal Trades Review*, v. 174, May 31, 1957, p. 1263-1266, 1275. (From *Revue de Metallurgie*, no. 12, 1956.)

Practical applications from billet preheating to glass removal. Glass properties and properties of extruded products. (F24; ST, NM-h)

183-F. Production of Forgings at the Bromsgrove Works of Garringtons Ltd. *Metal Treatment and Drop Forging*, v. 24, Oct. 1957, p. 401-406.

To be continued. (F22)

184-F. Scaling of Billets. Pt. 2. J. Moreau and M. Cagnet. *Metal Treatment and Drop Forging*, v. 24, Oct. 1957, p. 407-415.

Depth of contamination; depth of decarburization; oxidation and influence of reheating period; isothermal kinetics of oxidation in air of four steels; nature of scaling phenomena. (To be continued.) (F21b; ST, 4-2, 9-2)

185-F. Effects of High Strain Rate in Strip Rolling. D. G. Christopherson and B. Parsons. *Sheet Metal Industries*, v. 34, Oct. 1957, p. 769-775.

Use of a small specially designed rolling mill operating on the Stecke

principle was used for testing high-conductivity copper, aluminum and mild steel. Strain-rate effect, roll-force, stress against strain curves and results of rolling tests. 6 ref. (F23, 1-2, 3-18; Cu, Al, CN, 4-3)

186-F. Welded Tubing Spurs Zirconium Use. *Steel,* v. 141, Oct. 21, 1957, p. 80-82. (CMA)

Strip in coil form is threaded into the forming section of a tube mill until it reaches two squeeze rolls positioned under a welding head. The tube is then arc welded in an argon-helium atmosphere. Inside and outside diameter is reduced by swaging and, after vacuum annealing, the tubing is straightened in standard equipment. If further reduction is necessary, a draw bench is used with or without mandrel. (F26p; Zr)

187-F. Processing of Uranium-Zirconium Alloys. J. W. Holladay, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-877, Oct. 20, 1953, 17 p. (CMA)

U-Zr alloys were prepared by arc-melting and induction melting. Forging and rolling characteristics were investigated. Some of the alloys had additives of Cb, Ti, Th, Sn, or Mo. The latter showed the most promise. (F22, F23, 17-2; U, Zr)

188-F. Zircaloy-2 Clad Bi-Metal Fuel Extrusion. R. E. Droegkamp. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-230, Nov. 4, 1954, 6 p. (CMA)

A uranium-silicon fuel clad with 30 mils of Zircaloy-2 and 15 mils of U-12Mo barrier layer was studied for extrusion characteristics. A maximum press capacity was required to extrude to an 18:1 reduction. The fuel erupted through the clad almost continuously along the rod length. Intimate contact without diffusion was observed. Rupture appears to have occurred because of the relative hardness of U-12Mo as compared with U-Si. (F24; U, Zr, 8-16)

189-F. Tests Carried Out on Diamond Wire-Drawing Dies. Pt. 1. *Wire Industry,* v. 24, Sept. 1957, p. 831-835, 873.

Tests of performance of diamond dies used for drawing copper wire. (To be continued.) (F28, W24n, 1-2; NM-k37)

190-F. Manufacture of Steel Wire for the Needle Industry. B. Hojna. *Wire Production,* v. 6, June-July 1957, p. 5-9. (From *Strojirenstvi,* no. 11, 1956, p. 751-756.)

Manufacturing methods, metallurgical problems involved and structural changes occurring during the drawing process. (To be continued.) (F28; ST)

191-F. (French.) **Skin Pass Provides Controlled Stretch.** P. Blain. *Technique Moderne,* v. 49, July 1957, p. 391-392.

Description of rolling mill and controls capable of preventing formation of Luder's lines on steel strip. (F23, 1-2; ST, 4-3)

192-F. (French.) **Auxiliary Rolling Mill Equipment for Shearing, Slitting and Inspecting Thin Sheet and Tin Plate.** J. Breuzet. *Technique Moderne,* v. 49, p. 419-422.

Elements, functions, characteristics, selection, operation of shearing and slitting lines. (F29n, F29q, 1-2; ST)

193-F. (Russian.) **Stress Conditions in Metal Deformation and Strip Rolling.** M. A. Benyakovskii, V. I. Kulikov, V. A. Shadrin, I. P. Kolpakov, Y. S. Kutuyev, G. G. Kustobaev, M. F. Kochniv, I. V. Esipov and B. I. Petrov. *Stal',* v. 17, Jan. 1957, p. 59-63.

Measuring stresses in strip mill units with strain gages yield data which can be utilized to increase production. (F2, W23c, X28h, 1-2)

194-F. (Russian.) **Automation of Heating Facilities in Rolling Mills.** A. M. Kulakov and I. M. Gelfand. *Stal',* v. 17, Jan. 1957, p. 80-83.

Automatic control of heating installation reduced fuel consumption, increased production and minimized scrap due to improper heating. However, automation does not extend to feeding of the metal into the furnace. (F21b, F23, 18-24)

195-F. (Russian.) **Investigation of Rate Regulator Performance on Light Merchant Mills.** O. G. Muzalevskii and B. B. Lure. *Stal',* v. 17, Feb. 1957, p. 135-140.

Efficient use of rolling rate regulator cannot be assured unless feed is properly controlled, billets made in equal lengths and slipping is eliminated in the roughing stands. (F23, X13, 1-2)

196-F. (Russian.) **Study of Diagonal Rolling on Three-Roll Tube Mill.** P. K. Teterin, F. A. Danilov and Ya. V. Manegin. *Stal',* v. 17, Feb. 1957, p. 147-151.

The study determined the nature of metal flow under the rolls, the dependence of the angle of torsion, amount of slippage, pressure on the rolls, power consumption and correlated motor load to basic technical factors. (F26s, W23h, 1-2)

197-F. (Swedish.) **Modern Copper and Aluminum Rolling Technique.** C. A. Jacobsson. *Jernkontorets Annaler,* v. 141, Aug. 1957, p. 395-456.

Techniques in rolling wire rods, tubes and strips; automation of mills. (F23, 18-24; Cu, Al)

G Secondary Mechanical Working

Forming and Machining

405-G. New Angle in High-Speed Turning. *American Machinist,* v. 101, Oct. 7, 1957, p. 122-123. (CMA)

Application of a new tool geometry in high-speed turning of Ti-150A. Speeds of 1600 sfpm. are attained when the cutting tool is held at 50° to the axis of the workpiece; tool life is 1 hr. The holding device is designated the "Cross Chord" tool and all the angles are incorporated. The clamp acts as a chip guide. The flatness of chip shear plans permits high feed rates. (G17a; Ti)

406-G. Bringing Science to Art. Floyd G. Lawrence. *Automatic Machining,* v. 18, Sept. 1957, p. 40-41.

Notes ASTE program for research in metal cutting and machinability. Literature compilation nears completion. (G17, A9, 11-15)

407-G. Stainless Steel. Pt. 5. J. A. Ferree. *Automatic Machining,* v. 18, Sept. 1957, p. 60-64.

Speeds, feeds, tool types and other suggestions for turning, cutting off, forming, boring stainless steels. (G17; SS)

408-G. New Techniques in Sheet Metal Forming. John A. Grainger. *Institution of Production Engineers, Journal,* v. 36, Sept. 1957, p. 593-606.

Less orthodox methods of presswork, which are considered as being high-production methods of the future, if and when machines and equipment are developed to such state of perfection and cheapness as to be an economic investment. Covers triple-action presses, "Marforming", "Hydraw" and "Hydroform" processes, "dyzacking" and flow-turning. (G9, G14; 4-3)

409-G. Milling Titanium Alloys: Experience Modifies Thinking. A. L. Winkler. *Iron Age,* v. 180, Oct. 10, 1957, p. 126-128. See also: **Tips on Titanium Milling.** A. L. Winkler. *Steel,* v. 141, Oct. 7, 1957, p. 176, 178, 181. (CMA)

Facing, milling and slotting tests were run on AMS 4925 titanium forgings. Recommendations are given. (G17b; Ti, 4-1)

410-G. New Theory Bolsters Grinding Research. P. M. Unterweiser. *Iron Age,* v. 180, Sept. 12, 1957, p. 127-129.

Note on approach to accurate measurement of temperatures in the analysis of heat generated during grinding operation. (G18, S16)

411-G. On the Multiple Hole Extrusion of Sheets of Equal Thickness. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 267-280.

Slip-line fields are proposed and pressures calculated for extrusion of sheet through square die containing one, two or three orifices, when container walls are perfectly smooth or rough. Experimental determinations of parameter p/2k for pure lead, tellurium lead and pure tin are compared with those predicted. Actual rate of flow of material through each orifice of three-hole die is compared with predicted rate. 7 ref. (G5; Pb, *Te,* Sn)

412-G. The Cold Extrusion of Circular Rods Through Square Multiple-Hole Dies. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 281-295.

Experiments were carried out to determine pressure necessary to cold extrude pure lead, tellurium-lead, pure tin and super-pure aluminum through 90° dies containing up to four holes arranged in different patterns. Formula was deduced for calculation of required pressure; summary of observations on nature of flow of metal during its passage through die holes is given; experimental results affording comparison between plane-strain and axisymmetric pressures and flow patterns are described. 11 ref. (G5; Pb, *Te,* Sn, Al)

413-G. North American Research on Machining Titanium Alloys. Kenneth Loo. *Machinery,* v. 64, Oct. 1957, p. 157-161. (CMA)

Titanium alloy plates are friction-sawed effectively dry with dull blades at speeds of 10,000 sfpm. Carefully annealed alloys show little warpage. Sharp tools prevent burring and work hardening. Throw-away insert-type carbide cutters are preferred for turning operations. Research does not support the view that the segmented chip is a characteristic of titanium. Such chips are caused by ultrasonic vibration. Segmentation is influenced more by tool rigidity than feed or speed. (G17; Ti)

414-G. Hot Forming Operations on Titanium. E. A. Wooden and T. P. Iodice. *Machinery (London),* v. 91, Sept. 13, 1957, p. 637-645. (CMA)

Hot forming operations on titanium for intricate contours and small-radius bends without fractures or distortion. Heating is controlled to a temperature which is dependent on the part formed and the forming method. In stretch forming the form blocks of different design have built-in heating units; 300-400° F. temperatures have been adequate.
(G1, 1-16; Ti)

415-G. The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging,* v. 24, Sept. 1957, p. 351-357.

Various formulas are developed to assess machining performance by tensile properties and to provide an index of machinability. 27 ref.
(G17k)

416-G. Experiments on the Cold Forming of Titanium as Carried Out by Briggs Motor Bodies, Ltd. P. G. Patten. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 741-744.

Use of a chemical immersion coating during the press forming of titanium. Treatment involves simple immersion with a short-time cycle giving a dark gray fine crystalline coating from an inorganic solution.
(G1, 1-17; Ti)

417-G. Forming Titanium Sheet. *Tool Engineer,* v. 39, Oct. 1957, p. 123. (CMA)

Hot forming is necessary for titanium, but the method may be conventional otherwise. Graphite is the lubricant used in the 1000-1350° C. drawing range. In this range the shapes can be more intricate and the draws deeper, while hydrogen embrittlement is minimized. Spring-back is no problem and intermediate anneals are unnecessary.
(G1, 1-16; Ti, 4-3)

418-G. How to Design Practical Tooling for Cold Extrusion. John Verson. *American Machinist,* v. 101, Oct. 7, 1957, p. 129-144.

Principles of cold impact extrusion of steel; metal flow and other factors in the design of punches and forward and backward extrusion dies. (G5, 1-2, 17-1)

419-G. Use of Coated Steels in Drawing. *Industrial Finishing,* v. 9, Sept. 1957, p. 811-812.

Electroplated zinc coating or phosphate coatings on iron and steel increased drawability as indicated by wedge draw test.
(G4, 17-2; ST, NM-h)

420-G. Choose Your Press Drawing Lubricants With Care. Leon Salz. *Lubrication Engineering,* v. 13, Sept. 1957, p. 494-500.

Functions of drawing lubricants; relative drawability of stainless, high-carbon, low-carbon steels, brass and aluminum; influence of condition of metal on drawability; die efficiency; drawing lubricant components; classification of press drawing lubricants; metallic coatings as an aid to lubrication process. (G4, 17-2; SS, ST, Cu, Al, NM-h)

421-G. Cutting Fluids: Fundamentals and Laboratory Evaluation. L. H. Sudholz. *Lubrication Engineering,* v. 13, Sept. 1957, p. 509-515.

Tool life, surface finish, tool wear, power requirements as fundamentals of cutting process; nature of problem of lubrication, effect of cutting fluids; means of laboratory evaluation. For accurate evaluation, actual metal cutting operations under carefully controlled conditions, as opposed to analytical and even bench tests, are required. New test techniques, such as radioactive tracer method for evaluating life of cutting tool, are rapid, and results correlate with field experiences.
(G17, 17-2, 1-4; NM-h)

422-G. Evaluating Cutting Fluids in Accelerated Machining Tests. F. J. Dasch, P. L. Eisler, W. D. McHenry and R. K. Paton. *Lubrication Engineering,* v. 13, Sept. 13, 1957, p. 516-520.

Studies conducted with radioactive tools to establish relative performance of three emulsifiable and three compounded mineral oils. Significant difference was found in rate of tool wear between two types of oils; no significant difference was noted between oils within either group. Parallel study of tangential and feed forces proved insensitive for conditions of these tests. (G17; NM-h)

423-G. Some Recent Applications of Chemical Machining. C. L. Hibert. *Machinery,* v. 91, Sept. 20, 1957, p. 682-686.

Capabilities and specific applications of chemical milling to production of aircraft components from aluminum, magnesium and titanium alloys and stainless steels.
(G24b; Al, Mg, Ti, SS)

424-G. Experiences and Problems in the Surface Treatment of Die-Castings. Pt. 1. Mechanical Processes. W. Ruegg. *Metal Industry,* v. 91, Oct. 18, 1957, p. 333-335.

Working methods employed by Injecta Ltd. (Switzerland) for the surface treatment of zinc and aluminum pressure die castings. Grinding, polishing, sand blasting and barrel polishing. (To be continued.) 4 ref.
(G18, L10, L12; Zn, Al, 5-11)

425-G. Electrical Discharge Cuts Difficult Slits. E. J. Lach and C. Munter. *Metalworking Production,* v. 101, Sept. 20, 1957, p. 1709-1711.

Electrical discharge machine cuts slit in uranium and Monel rings used in high-speed rotors for neutron research. (G24a; U, Ni)

426-G. Temco Overcomes Titanium Bottlenecks. D. L. Beasley. *Modern Industrial Press,* v. 19, Oct. 1957, p. 34-35. (CMA)

Aircraft parts are made from 0.016 to 0.100-gage sheet and are either formed hot at 1000° F. or formed cold and stress relieved at 1000° F. for 30 min. The oxide coating formed during heating is removed by a patented descaling process. (G1, L12; Ti)

427-G. Dewalt's New System Takes the Guesswork Out of Sawing Aluminum. Oscar H. Nus. *Modern Metals,* v. 13, Sept. 1957, p. 46-56.

Blade size, speed, horsepower requirements and cutting position determination for high-speed sawing of aluminum alloys. (G17h; Al)

428-G. Magnesium Alloy Sheet. F. L. Coenen. *Modern Metals,* v. 13, Sept. 1957, p. 88-90.

Considerations in shearing and blanking, brake forming, roll forming, stretch forming, rubber pad forming, drop hammer forming and deep drawing of FS—1 magnesium alloy. (G general; Mg, 4-3)

429-G. Experiments on the Cold Forming of Titanium. P. G. Patten. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 741-744. (CMA)

Pretreatment by degreasing and pickling. Drawing of cups; annealing, sodium hydride descaling and reprocess coating. (G4; Ti)

430-G. Choose the Right Lubricant. Pt. 1. Leon Salz. *Steel,* v. 141, Oct. 14, 1957, p. 132-135.

Water dispersible and oil-type lubricants and factors governing their selection for stamping or drawing operations on carbon alloy or stainless steels, aluminum and copper-base alloys.
(G3, G4; CN, SS, Al, Cu, NM-h)

431-G. This Thing Called Machinability. Pt. 2. W. A. Nordhoff. *Western Machinery and Steel World,* v. 48, Sept. 1957, p. 98-101.

Tabulated data on power requirements and horsepower values for units of stock removed per minute for turning, drilling or milling a wide variety of metals and application of this information to obtain optimum production. (G17)

432-G. (German.) **Argon-Arc Cutting of Nonferrous Metals.** E. Witting. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 391-394.

The gas shielded cutting process; characteristics of nonferrous metals; cost factors. 5 ref. (G22h; EG-a38)

433-G. (Italian.) **Liquid Coolants for Metalworking.** Domenico Viotti and Angelo Albertocchi. *Ingegneria Meccanica,* v. 6, July 1957, p. 17-22.

Practical problems involved in storing, handling and use of cutting fluids; factors to be used as guides in selection of best fluid for each operation; functions and properties of various types of coolants.
(G general, NM-h)

434-G. (Italian.) **Stamping of Metals by Hot Plastic Deformation. Pt. 7. Sawing.** Romeo Giusfredi. *Rivista di Meccanica,* v. 8, Aug. 3, 1957, p. 13-15.

Types of sawing machines, operational details. (To be continued.)
(G17h, 1-2)

435-G. (Norwegian.) **Chip-Forming Machining of Titanium.** *Teknisk Ukeblad,* v. 104, Sept. 19, 1957, p. 761-765. (CMA)

Ranges of speed and feed and recommended tool geometries for turning, boring, broaching, milling and other operations. American literature sources quoted. 19 ref.
(G17; Ti)

436-G. (Russian.) **New Wheel Producing Department of Nizhnii Tagilskii Metallurgical Combine.** S. V. Makaev, G. V. Kotelnikov, M. I. Staroseletskii and L. A. Narutskaya. *Stal',* v. 17, July 1957, p. 616-621

Description of a new wheel producing department; cutting, stamping and heat treatment operations.
(G3, J general; ST)

437-G. (German.) **Economy in Free-Cutting Machining.** Milton C. Shaw. *Industrie-Anzeiger,* v. 79, July 12, 1957, p. 847-851.

Determination of optimal relationship between cutting speed and feed to achieve low cost. 7 ref. (G17, 17-3)

438-G. (German.) **Self-Stimulated Vibrations During Manipulations of Metals.** Milton C. Shaw and W. Hölken. *Industrie-Anzeiger,* v. 79, Aug. 6, 1957, p. 959-964.

There are two types of self-stimulated vibrations during machining; the first occurs when the system tool-workpiece oscillates in vicinity of free tool. Tool movement in this oscillation is primarily in direction of principal section force. The second occurs when frequency of the system tool-workpiece lies in vicinity of natural frequency of free tool. The main cause of this oscillation

is change of shearing angle created by periodical change of free surface inclination during the operation. 6 ref. (G17, Q10)

439-G. (Italian.) **Machining Nimonic Alloys.** *Nickel,* no. 69, Aug. 1957, p. 1-7.

General rules for machining as influenced by character of the metal. Specific recommendations as to techniques, tooling and lubrication for milling, broaching, turning, grinding, reaming, sawing and tapping operations. Tables of composition, physical properties, test performance. (G17; Ni)

440-G. (Pamphlet.) **Machining and Grinding of Gray and Nodular (Ductile) Cast Irons.** Norman Zlatin and Charles F. Walton. 57 p. 1957. Gray Iron Founders' Society, Inc., 930 National City—E. 6th Bldg., Cleveland, Ohio. $3.

For use in the design, engineering and production of cast components; commercial and practical examples. (G17, G18, CI-n, CI-r)

H Powder Metallurgy

77-H. Some Experiments on the Extrusion of Magnesium and Aluminium Powders. H. G. Cole. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 29-35.

Smooth extrusions of good mechanical properties can be made from magnesium powders at low extrusion speeds provided that the billet temperature exceeds 470° C. Alloy extrusions containing extra dispersed oxide can be made by extruding reactive mixtures of a metal powder with a metal-oxide powder. 14 ref. (H14k; Al, Mg)

78-H. Design for Metal-Powder Parts. Robert Talmage and John Kolb. *Metalworking Production,* v. 101 Sept. 27, 1957, p. 1737-1742.

Basic powder metallurgy process and data on part volume, weight dimensions and density as related to component design for shapes such as solid cylinder, flanged solid cylinder, flanged cylinder with holes and raised or recessed horizontal contour. (H general, 17-1)

79-H. Vacuum Sintering. Pt. 1. Theory and Practice. Henry H. Hausner. *Precision Metal Molding,* v. 15, Oct. 1957, p. 44-45, 88-89.

Role of vacuum as sintering atmosphere and effect on physical properties of metal powder compacts. 11 ref. (H15n, 1-23)

80-H. Extreme Precision Is Possible. Nathan H. Sanderson. *Precision Metal Molding,* v. 15, Nov. 1957, p. 42.

Powder metallurgical techniques can accomplish very high precision, but only where much higher than usual costs can be tolerated. (H general, 17-3)

81-H. Controls Used in Powder Metallurgy. John H. Speck. *Precision Metal Molding,* v. 15, Nov. 1957, p. 82-83.

Controls for furnace temperature, powder, time, atmospheres and gas generators. (H general, X general, 1-2)

82-H. Vacuum Sintering. Pt. 2. Henry H. Hausner. *Precision Metal Molding,* v. 15, Nov. 1957, p. 91-92, 94-95.

Possible use of very low pressures in the sintering of powdered metal parts. (H15n, 1-23)

83-H. (Russian.) **Some Regularities Observed in the Process of Compression of Powder Mixtures Used in the Preparation of Hard Alloys.** A. G. Samoilov. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 159-162. (CMA)

Many defects in articles prepared from compressed and sintered powders are traceable to defective compression. A study of this process, made with powders used in the preparation of known hard alloys (WC + 15% Co and WC + TiC + 6% Co) revealed some regularities in the interdependence of the pressure of the piston during compression, pressure of the piston during extrusion of the compressed sample, the difference between the pressures at both ends of the sample, the lateral surface of the sample, and the height of the sample. (H14; W, 6-19)

84-H. (German.) **Production of Metal Powder Machine and Instrument Parts.** Friedrich Eisenkolb. *Neue Hütte,* v. 2, Aug. 1957, p. 461-470.

Applications; production processes for iron, nonferrous metal and light metal powder; metal powder tests; metal powder designed for production of sintered steels and sintered alloys; preparation of super-fine powders and powders having special particle shapes. 40 ref. (H general)

85-H. (German.) **Production and Testing of Sintered Compacts Made of Alumina and Chromium.** Friedrich Eisenkolb and Werner Schatt. *Neue Hütte,* v. 2, Aug. 1957, p. 471-481.

Pretreatment, pressing and sintering of the powder mixtures; hardness, specific gravity, flexural breaking strength and tensile strength; influence of additions; shock stress behavior; corrosion and electric resistance tests. 25 ref. (H general, Q general; Al, Cr, 6-22)

J Heat Treatment

255-J. Methods of Controlling Atmospheres in Furnaces. O. E. Cullen. *Industrial Heating,* v. 24, Aug. 1957, p. 1510-1522, 1534.

Principles of direct automatic control of atmospheres in heat treatment furnaces. Methods and the problems in sampling, measuring and controlling atmospheres by analysis of dew point or carbon dioxide in batch or continuous furnaces. (J2k)

256-J. Gas-Air Flame Hardening Increases Gear Strength. James P. Bates and C. A. Turner. *Industrial Heating,* v. 24, Aug. 1957, p. 1526-1534.

Hardness pattern and microstructure demonstrate desirable properties achieved by flame hardening and oil quenching of wench gear of C1046 steel. (J2h, T7a, ST)

257-J. Why Not Direct Quench? T. W. Ruffle. *Iron and Steel,* v. 30, Sept. 1957, p. 441-444.

Advantages, disadvantages and uses of direct quenching from carburizing vs. double reheat and quench and single reheat and quench. 3 ref. (J26, J28g; ST)

258-J. Nitriding Process. Case Hardening of Steel and Cast Iron by Nitrogen. R. W. Allott. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 335-338.

Brief review of development, nature and effect on mechanical properties of nitriding. Steels commonly processed and effect of prior heat treatment and recently developed techniques. (J28k; ST, CI)

259-J. Use of Nitrogen-Hydrogen Atmospheres in Metal Treating. *Industrial Heating,* v. 24, Oct. 1957, p. 2020-2022, 2026.

Gas-producing characteristics of new gas generator and application for nitrogen-hydrogen atmospheres. (J2k, W28q, 1-2)

260-J. Novel Conveyor System and Cast Alloy Components Enable Single Furnace to Do Three Heat Treating Jobs. E. A. Schoefer. *Industrial Heating,* v. 24, Oct. 1957, p. 2047-2054.

Multiple atmosphere heat treatments successfully achieved in a single, flexible gas-fired furnace. (J2k, W27g, W12r, 1-2)

261-J. How to Get More for Your Metalworking Dollar. Pt. 12. Heat Treating. *Iron Age,* v. 180, Oct. 24, 1957, p. 207-222.

Reference guide for heat treating steel, cast iron, stainless steel and aluminum. (J general; ST, CI, SS, Al)

262-J. New Temperability Calculator. Leonard Jaffe and Edward Gordon. *Iron Age,* v. 180, Oct. 24, 1957, p. 227-234.

Charts and scale for computing tempering treatments for desired hardness. (J29, 17-2; ST)

263-J. Precipitation Hardening Stainless Steels. Heat Treatment and New Materials in the U. S. Aircraft Industry. Allen C. Gilbraith. *Metal Treatment and Drop Forging,* v. 24, Oct. 1957, p. 395-399.

New "heat-hardenable" steels in the 300 series exhibit outstanding tensile and yield strengths. Heat treating procedures and an outline of honeycomb structures. (J27; SS)

264-J. Lines Anneal Fast Without Soaking. *Steel,* v. 141, Oct. 14, 1957, p. 124-129.

Continuous line for bright annealing of low-carbon steel strip for tinplate. (J23a, 1-11; CN, 4-3)

265-J. How to Avoid Cracking Die Steels. Pt. 2. *Steel,* v. 141, Oct. 7, 1957, p. 200-202.

Proper heat treatment and selection of steels for dies. (J general; TS, 9-22)

266-J. Construction and Characteristics of Heat Treating Facilities at the Watertown Arsenal Laboratories. S. Valencia. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131116, Oct. 1955, 29 p. $.75.

The facilities provide for the treatment of ferrous and nonferrous metals in connection with the Laboratories' over-all research and development program. A unique feature is a single, room-length instrument panel board which permits control of each furnace. Heat treating equipment includes one tube-type and several box-type electric furnaces, controlled atmosphere producers, rectangular and cylindrical salt-bath furnaces, an oil-tempering furnace and an air-tempering furnace, an induction heating unit, metal cleaning equipment, a low-temperature freezing unit, a vacuum heat treating furnace, and a controlled oil quenching system. (J general, 1-2, A9h)

267-J. (German.) **Heat Treatment of Malleable Iron in Swedish Foundries.** Hans Weber. *Gjuteriet,* v. 47, Aug. 1957, p. 166-172.

Survey of raw materials and processes; properties of the heat treated iron. 10 ref. (J23b; CI-s)

268-J. (German.) **Application of Protective Atmospheres in Heat Treatment of Steel.** *Chemische Rundschau,* v. 10, Aug. 1, 1957, (not numbered).

Use of hydrogen, nitrogen, carbon dioxide, carbon monoxide, hydrocarbons and dissociated ammonia in heat treatment of steel; technical application and chemical reactions. (J2k, RM-g)

269-J. (German.) **Hardening of Steel Parts in Automobile and Bulldozer Industry With Induction Heating.** Gluchanow. *Kraftfahrzeugtechnik,* v. 7, Aug. 1957, p. 308-311.

Induction heating procedures in U.S.S.R. in fabrication of crankshafts, cylinder liners, camshafts, differentials and gear wheels. (J2g, T21c; ST)

270-J. (German.) **Hardening and Tempering Steel.** *Technik und Betrieb,* v. 9, Apr. 1957, p. 49-50.

Various methods, technology, results. (J26, J29; ST)

271-J. (German.) **Surface Hardening by Nitriding.** Fritz O. Rabenhorst. *Technik und Betrieb,* v. 9, Apr. 1957, p. 51-55.

Bath nitriding with NS 350 is used as method to increase abrasion wear resistance in alloy steels (Cr, Al, W, Mo and V). Related methods of carbonitriding and nitriding are applied in special cases. (J28k, J28m; AY)

K Assembling and Joining

470-K. The Works Engineer's Approach to Welding. F. H. Dorney. *Australasian Engineer,* v. 50, Aug. 7, 1957, p. 52-57.

Suggested systematic approach designed to assist works engineer, who may or may not be familiar with welding, in promoting efficiency of welding work; method of analyzing costs of welding and equipment in order to obtain best over-all results. 6 ref. (K general, 17-3)

471-K. Ultrasonic Iron Solders Aluminum. Thomas J. Scarpa. *Electronics,* v. 30, Oct. 1, 1957, p. 168-169.

Oxide layer on metal is removed by electrically driven iron tip. Sonic field abrades surface of metal while molten solder forms alloy bond before further oxidation can take place. Work surface is heated by electric tip or gas torch. (K7h; Al)

472-K. Six Basic Steps to Good Silver Brazed Joints. *Industrial Heating,* v. 24, Aug. 1957, p. 1554-1560, 1662.

Steps are good fit, clean metal, proper fluxing, supporting of parts, heating and flowing alloy and final cleaning. (K8, *Ag*)

473-K. Paste Filler Metal Gives Dip Brazing a Boost. A. M. Setapen. *Iron Age,* v. 180, Sept. 12, 1957, p. 136-138.

Procedure for precleaning, brazing, flux removal in brazing aluminum alloy assemblies with paste filler and dip brazing equipment. (K8n; Al)

474-K. British Approach to Honeycomb Production. Some Comparisons Between British and American Practice. Peter Trippe. *Metalworking Production,* Aug. 30, 1957, p. 1503-1509.

British inventors consider present American methods too complicated. Dufaylite (British platent holders) pre-forms compound curves by ingenious method of varying glue line, which eliminates machining of expanded honeycomb per American practice. British claim to be ahead in techniques for producing airfoil sections, building large sections, in special methods for aluminum honeycomb, automatic and semi-automatic equipment for quantity production, laminating techniques. It is conceded that American firms are ahead on stainless steel and brazed sections in general. (K12; Al, SS, 7-9)

475-K. Magnesium Castings Can Be Welded Without Distortion. H. Mansfield and L. Gesualdo. *Product Engineering,* v. 28, Sept. 16, 1957, p. 94-95.

Spraying deposition of weld metal in welding castings with consumable electrodes and argon-shielded arc resulted in sound welds. (K1d; Mg, 5)

476-K. Brazing Filler Metal. Pt. 1, 2, 3. *American Machinist,* v. 101, Oct. 7, 1957, p. 147-151.

Application, composition and brazing temperature range for aluminum-silicon, copper-phosphorus, silver, copper-gold, copper-zinc, magnesium and nickel-chromium types of brazing alloys. (K8; SGA-f)

477-K. Some Welding Developments Applicable to the Fabrication of Heavy Pressure Vessels for Nuclear Power Stations. J. A. Lucey, A. H. B. Swan and P. F. Wilks. *British Welding Journal,* v. 4, Oct. 1957, p. 449-457.

Manipulators enable automatic welding of spherical vessels; downhand welding of heavy plates at exceptionally high speeds using multipower tandem welding; new semiautomatic processes, and a new low-hydrogen rutile-iron-powder electrode for manual welding. 6 ref. (K general, W11p)

478-K. Fabrication, Erection, and Welding of the Dounreay Sphere. J. McLean and J. A. Forrest. *British Welding Journal,* v. 4, Oct. 1957, p. 457-466.

(K general, T26q)

479-K. Fabrication of Special Equipment for the Nuclear Energy Industry. C. A. Terry, N. H. Shuttleworth and D. C. Moore. *British Welding Journal,* v. 4, Oct. 1957, p. 466-474.

Several examples of fabricated components made for atomic fuel processing plant, for the gas-cooled reactor at Calder Hall, and for the DIDO research reactor. Materials of construction, the joining processes adopted, and means of obtaining the high standards of joint quality required. (K general, W11p)

480-K. Welding Problems in Future Reactors. I. H. Hogg. *British Welding Journal,* v. 4, Oct. 1957, p. 482-488.

Components of nuclear reactors of interest to the welding engineer are the fuel container, the core vessel, the external circuit and heat exchangers, and the enclosing vessel or building. Problems involved include the welding of special materials and thick pressure vessels. Possible repair of reactors under radioactive conditions. (K general, W11p)

481-K. No Flux for Aluminum. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 47.

New process to solder aluminum lifts oxide and wets metal without the aid of flux. (K7; Al)

482-K. Brazing Stainless Honeycomb Pane for Convair Supersonic Aircraft. Charles E. Rorick. *Industrial Heating,* v. 24, Oct. 1957, p. 1070-1078.

A new Holcroft brazing furnace for sandwiching metallic foil cores between very thin sheets of 17-PH stainless steel. (K8j, 1-2; SS, 7-9)

483-K. Brazing of Sandwich Structures in High-Temperature Vacuum Furnace. Phal Fair. *Industrial Heating,* v. 24, Oct. 1957, p. 1981-1986.

North American Aviation, Inc., has recently installed one of the world's largest cold wall vacuum furnaces for brazing honeycomb sandwich structures. Rectangular in shape, this furnace has a high temperature and vacuum range. (K8j, 1-2, 1-23, 7-9)

484-K. Solar Aircraft Honeycomb Structures Brazed in Unique Elevator-Type Furnaces. *Industrial Heating,* v. 24, Oct. 1957, p. 1991-1994, 2004.

Two new furnaces are believed to be the first such units specifically developed for the high-temperature brazing of all-metal honeycomb structures. (K8j, 1-2, 7-9)

485-K. What the Russians Are Doing With Welding. Henry Brutcher. *Industry and Welding,* v. 30, Oct. 1957, p. 48-54, 94.

Russian developments including magnetic tape flaw detection and CO_2 shielded welding techniques; welding specifications and data. (K general)

486-K. Preheating: Where and How to Use It. H. J. Nichols. *Industry and Welding,* v. 30, Oct. 1957, p. 80-81, 83.

Advantages of preheating before welding of carbon or alloy steels. (K9p; CN, AY)

487-K. What It Takes to Weld Aluminum. Pt. 2. *Marine Engineering Log,* v. 62, Oct. 1957, p. 98, 99, 175.

Tungsten-arc, carbon-arc, atomic hydrogen methods; general conditions to be observed to obtain sound welds. (K1; Al)

488-K. New Powdered Alloy Simplifies Aluminum Brazing. A. M. Setapen. *Modern Metals,* v. 13, Sept. 1957, p. 40-44.

Brazing alloy containing 88% aluminum and 12% silicon powdered and combined with flux cement eliminates need for preplacing of filler metal in aluminum assemblies to be brazed. (K8; Al, SGA-f)

489-K. Look What's Happening to Honeycombs. *Steel,* v. 141, Oct. 14, 1957, p. 116-119.

Core machining, cleaning, sandwich assembly, brazing and heat treatment of stainless steel honeycomb. (K8, G17, J general; SS, 7-9)

490-K. Brazing Alloy Selector. *Steel,* v. 141, Oct. 7, 1957, p. 162-165.

Applications, trade names, compositions, melting ranges of 400 brazing alloys of aluminum-silicon, copper phosphorus, silver, copper-gold, copper-zinc, magnesium and nickel-chromium alloy types. (K8; SGA-f)

491-K. Welding of Cans for Titanium Extrusions. E. F. Bulson. *U. S. Atomic Energy Commission,* Knolls Atomic Power Laboratory, KAPL-M-AME-4, Jan. 22, 1957, 13 p. (CMA)

The application development is described for the welding of titanium

triflutes, cruciforms and rectangular containers of various thicknesses. An inert arc method in a welding dry box with automatic control of voltage was used. A graph is shown for maintaining controlled weld penetration. (K1d, F24; Ti, 8-16)

492-K. Guided Bend Test as a Means of Qualifying Butt Welds in Zircaloy-2 and 3. S. A. Toftegaard. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission,* KAPL-M-SAT-4, Apr. 5, 1957, 11 p. (CMA)

Pre-weld annealing of Zircaloy-2 and 3 permitted good butt welds to be bent 180°. Increasing the helium purity of the protective atmosphere did not, nor did increasing the bend radius. Welds in cold rolled Zircaloy made with higher heat input to widen the heat affected zone allowed bends to specification. (K9r, K1d; Zr)

493-K. Temperature Measurements at the Metal Cutting Tip-Shank Interface. W. O. Woods. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131004, May 1956, 18 p. $.50.

Determined the machining temperatures which adhesives must withstand for effective bonding of cutting tool tips to tool shanks; temperatures were measured at the metal cutting tip-shank interface for ceramic as well as cemented carbide and high speed toolsteel cutting materials. (K12, 2-12; TS, SGA-j)

494-K. Brazing for Greater Productivity. Pt. 1. G. M. A. Blanc and Rene D. Wasserman. *Welding Engineer,* v. 42, Oct. 1957, p. 42-44.

Variation in tensile strength, melting time and price with bonding temperature of silver alloy filler metals used in silver brazing. (K8; Ag, SGA-f)

495-K. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 42, Oct. 1957, p. 56-61.

Mechanical properties of joints and chemical composition of filler metals for welding aluminum and aluminum alloys by means of inert-gas metal arc welding, inert-gas tungsten arc welding, metal-arc, oxyacetylene or atomic hydrogen. (K1, K2; SGA-f)

496-K. Shielding Gases for Inert-Gas Welding. W. H. Helmbrecht and G. W. Oyler. *Welding Journal,* v. 36, Oct. 1957, p. 969-979.

Recent developments and recommendations on best shielding gas for all metals of commercial importance. Arc characteristics, flow rate and weld quality. 3 ref. (K1d; EG-m, RM-g)

497-K. (German, French, Spanish, English.) **Resistance Welding of Stainless Steel.** *Aciers Fins and Speciaux Francais,* no. 26, July 1957, p. 58-61.

Principles and application; dimensions of electrode tips and adjustment of machines for spot, projection or roller spot welding. (K3; SS)

498-K. (German.) **Experience With Basic Electrodes in Finland.** Olavi Eiro. *Schweissen und Schneiden,* v. 9, Aug. 1957, p. 379-381.

Welding boilers; preparing welds for application in sea water; notch impact strength of welds. (K1, W29h)

499-K. (German.) **Efficient Torch Soldering.** H. H. Grix. *Schweissen und Schneiden,* v. 9, Aug. 1957, p. 381-385.

Testing solders and fluxes; design of soldered joints; automatic and semi-automatic devices. (K7c)

500-K. (German.) **Fisheyes in Steel Welds.** W. Hummitzsch. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 386-391.

Causes; investigation of the mechanism of formation by means of supersonic wave testing; reduction of hydrogen content of welds. 6 ref. (K general; ST, 9-20)

501-K. (German.) **Welding Railroad Track by Oxy-Acetylene Torch.** W. Kilbert. *Schweissen und Schneiden,* v. 9, Sept. 1957, p. 425-429.

Advantages of oxy-acetylene welding; hard facing rails; construction and maintenance of oxy-acetylene welded rails; cost calculations. 5 ref. (K2h, T23q)

502-K. (Russian.) **Effect of Welding on the Properties of Heat Treated Rimmed Steel.** A. S. Astafev. *Stal',* v. 17, Feb. 1957, p. 158-162.

Preliminary hardening with subsequent tempering improves the properties of the metal. When welded according to recommendation, the joint has satisfactory mechanical properties at temperatures below zero. 4 ref. (K general, Q general, 1-13; ST-d)

503-K. (Spanish.) **Fabrication of Oil Pipe Lines by Means of Welding.** C. Deutsch. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 5 p.

Improvements in manufacture of welded pipe and in methods of welding pipe lines, together with proper organization of work in the field, make possible savings of time and money in welded construction of lines. (K general, T26r)

504-K. (Spanish.) **Arc Welding Carbon Steels in CO_2 Atmosphere.** Celso Penche Felgueroso. *Ciencia y Tecnica de la Soldadura,* v. 7, July-Aug. 1957, 12 p.

Program of experimentation on Spanish steels. Theory and practice of technique and description of equipment used, on basis of U. S., British, French and Russian experience. 20 ref. (K1d; ST)

505-K. (German.) **Bonding of Metals.** G. Holzberger. *Adhäsion,* no. 4, July-Aug. 1957, p. 147-150.

Various new bonding methods and adhesives applicable to metals. (K5, K12)

506-K. (German.) **Sigma Welding.** H. Ernenputsch. *Industrie-Anzeiger,* v. 79, July 19, 1957, p. 879-881.

Theory, equipment, method, application, economy and advantages of shielded inert-arc welding in comparison with other methods. (K1d)

507-K. (German.) **Induction Soldering.** K. R. Pawlowitz. *Technik und Betrieb,* v. 9, June 1957, p. 21-22.

Economy and simplicity in various applications. (K7e)

508-K. (Japanese.) **Brazing.** Keiichi Mizuno. *Sumitomo Metals,* v. 9, Apr. 1957, p. 40-47.

Bronze solder is unsuitable for joining Albrac (aluminum brass) tube owing to weakening of joint members at the high temperature necessary for the brazing operation. A good joint was obtained with silver solder alloy of 30-50% Ag, 10-25% Cd, 15-25% Zn. (K8; Cu, *Al,* SGA-f)

509-K. (Japanese.) **Welding of Al and Its Alloys.** Toshio Amitani. *Sumitomo Metals,* v. 9, Apr. 1957, p. 48-52.

Bending, hardness and corrosion tests on argon gas tungsten arc welded wrought aluminum alloys. (K1; Al)

L Cleaning, Coating and Finishing

573-L. Sprayed Molybdenum and Its Applications. S. M. Wright. *Alloy Metals Review,* v. 8, Sept. 1957, p. 2-8. (CMA)

Vapor spraying of molybdenum results in the interlocking of small particles on the sprayed surface. The porosity accounts for the general average density of 90%. Hardness values of the deposit are misleading and cover a wide range. Applications of sprayed molybdenum are described. (L23; *Mo*)

574-L. Dow Latex 566: Gloss Systems for Metal. M. C. Carpenter. *American Paint Journal,* v. 42, Oct. 7, 1957, p. 88, 89, 92, 94.

Coating developed specifically for baked metal applications involves conversion of polymer into more thermosetting structure through effect of heat and catalysis. Pigment dispersion and wetting, pigment volume concentration and mechanism of film formation. Application is by spray. (L26p)

575-L. Precision Barrel Finishing. Pt. 4. William E. Brandt. *Automatic Machining,* v. 18, Sept. 1957, p. 51-57.

Examples used to demonstrate tumbling procedure and method of determining load percentage, slip size, water level and fixturing in finishing steel and nonferrous parts. (L10d)

576-L. Continuous Wire Plating Replaces Batch Process. *Automation,* v. 4, Oct. 1957, p. 67-68.

Continuous processing line built by Hanson-Van Winkle-Munning Co. in service at Wilbur B. Driver Co. cleans and triple-plates four strands of wire simultaneously. Cleaning, nickel strike, silver strike, silver plating, rinsing and drying operations are performed on wire traveling at 5 fpm., with given point on wire passing through system in about 10 min. (L17, L12, 1-11; 4-11)

577-L. How to Trace and Correct Defects in Aluminum Enamels. Paul A. Huppert. *Ceramic Industry,* v. 69, Sept. 1957, p. 96-97.

Causes of defects, including those attributable to base metal; corrective measures. (L27; Al, 9)

578-L. How to Combat Defects in Pickling Operations. *Ceramic Industry,* v. 69, Sept. 1957, p. 98 and following. (Two pages of tables)

Maytag Co. controls and analyzes metal surface preparation in order to avoid application difficulties and defects in porcelain enamel finishes. Tables of defects and possible causes requiring control, operating conditions, pickling process details, analysis schedule are included herein. (L27, L12g, 9)

579-L. Painting Structural Steel With Airless Spray. J. G. Pankratz. *Industrial Finishing,* v. 33, Sept. 1957, p. 64-66.

Paint is drawn from drum through heater to airless spray gun under 500-600 psi. pressure. Volatile portion of solvent with pressure provides finely atomized spray. Relatively little overspray permits painting in the open shop. (L26; ST, SGB-s)

580-L. The Chemical Treatment of Nickel, Nickel-Chromium and Chrome-Iron Alloys Prior to Electrodeposition. E. Morley. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 102-104.

Principle employed is reduction by cathodic treatment of oxide film formed when the work has been treated anodically. Technique refers mainly to fusion of glass to copper-plated chromium alloys.
(L13; Ni, Cr, Fe)

581-L. Alkaline Electro-Brightening and Anodizing of Aluminum. N. D. Pullen and B. A. Scott. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 163-176.

Details of process which involves two stages; anodic treatment at 12 volts d.c. in a hot alkaline electrolyte followed by normal anodizing in dilute sulphuric acid electrolyte. 11 ref. (L19n; Al)

582-L. Some Studies of Phosphoric Acid-Based Chemical Brightening Solutions for Aluminum. A. W. Brace and T. S. De Gromoboy. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 177-197.

Operating characteristics of various baths, such as amount of metal dissolved for various treatment times, effect of temperature, amount of aluminum dissolved before bath became exhausted and response of various alloys. Mixtures investigated were phosphoric-sulphuric acid, phosphoric-sulphuric-nitric acid, phosphoric-acetic-nitric acid and phosphoric acid-water-nitric acid. 9 ref. (L12g; Al)

583-L. Studies in Bright Anodizing by the Ammonium Bifluoride-Nitric Acid Process. G. E. Gardam and R. Peek. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 198-210.

Determination of satisfactory concentrations of nitric acid and ammonium bifluoride, effect of lead and other additions and of temperature. 3 ref. (L19; Al)

584-L. Chemically Brightened and Anodized Aluminum and Its Employment in Automobile Manufacture. F. Baumann and H. Neunzig. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 211-225.

Practical use of ammonium bifluoride process for treatment of strip-trim, window frames and bumpers. Defects of the material and procedures suitable for testing quality of anodic film. 7 ref.
(L19, T21c, 17-7; Al)

585-L. Smoothing of Mild Steel by Barrel Treatment in Oxalic Acid-Hydrogen Peroxide Solution. K. Sachs and M. Odgers. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 245-269.

Influence of initial surface texture, period of immersion and agitation by barrelling on chemical polishing of mild steel in Marshall's solution. 4 ref. (L12g; CN)

586-L. Electrodeposition of Tin-Zinc Alloys From Stannate-Complexone Solutions. A. E. Davies and R. M. Angles. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 277-285.

Substitution of trisodium salt of N-hydroxyethyl-ethylenediamine triacetic acid for sodium cyanide in alkaline tin-zinc baths permits deposition of satisfactory alloy deposits from a cyanide-free solution. 6 ref. (L17; *Sn, Zn*)

587-L. A Preliminary Investigation of the Formation of Cracks in Hard Chromium Electrodeposits and the Evolution of Hydrogen During Deposition. C. P. Brittain and G. C. Smith. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 289-305.

It was found that the release of bubbles of hydrogen from the surface of the cathode is a discontinuous process, occurring for definite periods at regular intervals. Periodic cracking of surface of cathode was found to be associated with the discontinuous evolution of hydrogen. 4 ref. (L17, *Cr, H*)

588-L. Automatic Plant for Bright Zinc Plating. J. Chadwick. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 314-327.

Essential processes for plating steel motor car accessories, details of tank construction and plant operation. (L17, 1-2; Zn)

589-L. Industrial Nickel Coating by Chemical Catalytic Reduction. Gregoire Gutzeit. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 383-423.

Process for depositing an amorphous, pore-free, high nickel-low-phosphorus alloy on metals and nonmetals. Composition, structure, corrosion resistance, physical and mechanical properties, applications and limitations. 32 ref. (L28; Ni)

590-L. Practical Brush-Plating. H. D. Hughes. *Institute of Metal Finishing, Transactions,* v. 33, 1955-56, p. 424-442.

Technique by which electrodeposits are made from electrolytes held in absorbent materials attached to portable electrodes. Requirements for solutions, anodes, electrical system and absorbent materials; characteristics of deposits; applications. 2 ref. (L29)

591-L. Etch Stainless Plaques Quickly and Profitably. *Iron Age,* v. 180, Sept. 12, 1957, p. 132-133.

Method and solutions for etching stainless steel. (L12g)

592-L. Solvent Degreasing. A Valuable Industrial Process. W. L. McCracken. *Iron and Steel Engineer,* v. 79, Aug. 1957, p. 73-80.

Review of solvent vapor cleaning, characteristics of trichlorethylene and perchlorethylene solvents, typical degreasing cycles and equipment. Equipment design considerations, operations and maintenance. (L12h, 1-2)

593-L. Vapor Stripping of Stop-Off Coatings. Edward R. Jorczyk. *Metal Finishing,* v. 55, Oct. 1957, p. 63-64.

Use of methylene chloride in a vapor degreaser. Stripping is possible of many types of organic coatings such as lacquers, paint, enamels and varnishes. (L12j)

594-L. Barrel Finishing. Pt. 3. Deburring and Allied Processes. Arthur S. Kohler. *Metal Finishing,* v. 55, Oct. 1957, p. 68-73.

Tumble flushing; shine rolling; burnishing; deburring; chip deburring; descaling; effect of shape of the parts on the amount of barrel action; surface finishes; choice of methods to use. (L10d)

595-L. Process for the Deposition of Molybdenum Inside Large-Bore Tubing. A. Hegarty. *Metal Finishing, Journal,* v. 3, Sept. 1957, p. 349-352. (CMA)

Work at National Research Corp. on the hydrogen reduction of $MoCl_5$ showed that reduction was most efficient at 20 mm. Hg, that sufficiently pure $MoCl_5$ could be obtained by heating the commercial material at 1 mm. Hg and 100° C. for 1 hr., and that no discontinuities built up on the surface. 3 ref.
(L28; *Mo*)

596-L. Thick Oxide Films on Aluminum Alloys. (Continued.) Preparation by Direct Current With Special Reference to Hard Anodizing. J. M. Kape. *Metal Industry,* v. 91, Sept. 6, 1957, p. 217-219, 222.

Anodic films removed from various Hiduminium and other alloys and produced by anodizing in electrolytes of various compositions show a uniformity of composition with regard to oxide content and acid content. The composition was found to be independent of the anodizing conditions in sulphuric acid electrolytes. (To be continued.) 5 ref. (L19; Al)

597-L. Electro-Chemical Deposition. J. W. Oswald. *Metal Industry,* v. 91, Sept. 17, 1957, p. 273-274.

Nickel and chromium electrodeposition processes at Fescol Ltd. can handle work up to six tons in weight and 15 ft. in length.
(L17; *Ni, Cr*)

598-L. Hard-Surfacing Weld Materials. W. A. Martin. *Ontario-Hydro Research News,* v. 9, Jan-Mar. 1957, p. 26-29.

Applications of weld hard-facing method of repair; types and causes of metal wear; choice of gas or arc welding; types and characteristics of hard-facing materials; testing of weld deposit quality. (L24)

599-L. Bright Nickel Plating in the Costume Jewelry Industry. Eugene N. Castellano. *Plating,* v. 44, Oct. 1957, p. 1083-1085.

Control and operation of bright nickel solutions; effects and advantages of bright nickel plating.
(L17, T9s; *Ni*)

600-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 3. Theoretical Aspects. D. J. Fishlock. *Product Finishing,* v. 10, Aug. 1957, p. 82-92.

Fundamental reactions, effect of cleaning and mechanical treatment on phosphate film, typical phosphate solution compositions and thickness, corrosion resistance and other characteristics of phosphate coatings.
(L14b)

601-L. Barrels of Savings. Ross Hill. *Western Metals,* v. 15, Sept. 1957, p. 49-52.

Note on barrel finishing and its advantages. (L10d)

602-L. Plating by Ultrasonics. *Chemical and Engineering News,* v. 35, Nov. 4, 1957, p. 50-51.

Acoustical energy improves chromium coatings; intricate shapes are brighter, harder, better covered.
(L17, 1-24; *Cr*)

603-L. Corrosion-Resistant Coatings—Natural, Chlorinated and Synthetic Rubber. E. G. Rawlings. *Corrosion Technology,* v. 4, Aug. 1957, p. 283-286.

Coatings for protecting steel and other metals from corrosive environment. (L26r)

604-L. Approved Method of Applying Cermet Coatings. *Engineer,* v. 204, Sept. 20, 1957, p. 436-437.

Rapid economical process at National Bureau of Standards, employs ordinary ceramic coating procedures to replace former flame-spraying method and provides hard, high-temperature facing for metal parts.
(L27; 6-20)

605-L. Cleaning and Electroplating of Magnesium. *Industrial Finishing,* v. 9, Sept. 1957, p. 792-801.

Solutions and procedure for alkaline cleaning, pickling with sulphuric acid, chromate-nitrate solution, acetic-nitrate solution, chromate-nitrate-hydrochloric solution, mechanical finishing and electroplating following zinc immersion coating and copper striking of the magnesium parts. (L12, L17; Mg)

606-L. Mechanism of Electrochemical Polishing. *Industrial Finishing,* v. 9, Sept. 1957, p. 802-803.

Material from recent Russian publication on mechanism of electrochemical polishing of steel, copper and nickel. 4 ref. (L13p; ST, Cu, Ni)

607-L. Flame-Sprayed Zinc Layers. E. Gebhert and H. D. Seghezzi. *Industrial Finishing,* v. 9, Sept. 1957, p. 804-808.

Tensile, hardness, impact, bend, compression and adherence properties of flame-sprayed zinc coatings. Effect of test piece thickness and flame adjustment on properties. (L23, Q general; *Zn*)

608-L. Chromic Acid Rinse Treatment. Radiometric Evaluation. S. L. Eisler. *Industrial Finishing,* v. 9, Sept. 1957, p. 818-821.

Radioactive chromium-51 used to measure adsorption of chromic acid from rinse by phosphated steel following treatment to produce coating of zinc or manganese phosphate. 6 ref. (L14b; Cr, 14-13)

609-L. Versatile Arrangement of Modern Finishing Line for Large-Scale "Job Shop" Processing. Frank X. Vasso. *Industrial Heating,* v. 24, Oct. 1957, p. 2095-2102.

Automatic continuous conveyor line with variable speed control, a five-stage washer, an electrostatic spray system and drying and baking ovens. (L26n, W12r, 1-2)

610-L. Effects of Ultrasonics on the Electrolytic Deposition of Metals. A. Roll. *Metal Finishing,* v. 55, Sept. 1957, p. 55-58, 63.

Literature review. Variations in hardness, pitting, deposition rate, surface appearance and current efficiency with the presence of ultrasonic vibration in plating bath for electrodeposit of Ni, Cr or Ag. 10 ref. (L17, 1-24; *Ni, Cr, Ag*)

611-L. Barrel Finishing. Arthur S. Kohler. *Metal Finishing,* v. 55, Sept. 1957, p. 59-63.

Barrel finishing, auxiliary barreling equipment, types and compositions of tumbling media, cutting, cleaning, burnishing, and descaling compounds used in barrel finishing. (To be concluded.) (L10d, 1-2)

612-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Sept. 20, 1957, p. 239-240.

Variations in abrasion resistance, appearance and porosity of anodic films on aluminum alloys with different electrolytes and anodizing conditions. (L19; Al)

613-L. Automatic Plating in the Lock Industry. *Metal Industry,* v. 91, Oct. 4, 1957, p. 298-300.

Fully automatic Cu-Ni-Cr plating plant has been installed at the Yale and Towne Mfg. Co., Willenhall, Staffs, England. (L17, T6s, 17-7; Cu, Ni, Cr)

614-L. An Examination of Oxide Films on Tin and Tinplate. S. C. Britton and K. Bright. *Metallurgia,* v. 56, Oct. 1957, p. 163-168.

Oxide films formed at various temperatures and in passivating solutions have been studied by controlled cathodic examination of films detached from the metal to obtain evidence of their composition. 12 ref. (L14a; Sn)

615-L. Here Are 10 Steps in Black Anodizing Aluminum Die Castings. *Precision Metal Molding,* v. 15, Nov. 1957, p. 56-57.

Particularly in machining die castings, many small-diameter, hard to reach holes must be drilled and tapped. (L19, G17e; Al, 5-11)

616-L. Color and Textures for Aluminum. R. V. Vanden Berg. *Product Engineering,* v. 28, Sept. 30, 1957, p. 101-108.

Range of surface treatment, mechanical, chemical and electrochemical and coloring methods give aluminum textures and colors for wide variety of uses. (L10, L12, L13; Al)

617-L. Testing and Examination of Electrodeposits. R. Quarendon. *Product Finishing,* v. 10, Sept. 1957, p. 79-89.

Sources of information; types of atmosphere, test arrangements, choice of test articles, accelerated tests and evaluation and assessment of results. 20 ref. (L17c)

618-L. Phosphating Processes and Their Applications in Metal Finishing. Pt. 4. Typical Processes. D. J. Fishlock. *Product Finishing,* v. 10, Sept. 1957, p. 94-104, 132.

Process details for phosphating aluminum, magnesium, zinc and cadmium surfaces for improving bonding of paint or coating subsequently applied. Phosphating treatments for improving corrosion resistance of aluminum, magnesium, cadimum, zinc and steel parts and structures. Phosphate coats for drawing, extruding and cold forming. 18 ref. (L14b; Al, Mg, Zn, Cd)

619-L. Barrel Tumbling. How to Get Best Results. R. W. Fitch. *Product Finishing,* v. 22, Oct. 1957, p. 28-42.

Recommendations on media, water level, cleaning compound, abrasive additives, barrel speeds, rinsing, drying, and separation of media from parts in barrel finishing operations. (L10d)

620-L. Chromate Conversion Coatings on Hot Dipped Galvanize. Charles W. Ostrander. *Product Finishing,* v. 22, Oct. 1957, p. 60-72.

Historical development, definition, protective value, hardness and bonding properties; operations in treating galvanize and present uses of chromate conversion coating on hot dip galvanized steel. (L14c, L16; ST, *Zn*)

621-L. Mastics for Corrosion Control. W. W. Henderson. *Tappi,* v. 40, Sept. 1957, p. 216A-219A.

Mastics as corrosion control coatings in all industries using steel, tankage, and iron or steel equipment; types and uses of *Erkote* mastics; recommendations for pretreatment of surfaces and for application of mastics. (L26; ST, CI)

622-L. Oxidation-Resistance Coating for Molybdenum. J. R. Blanchard. Climax Molybdenum Co., Quarterly Progress Report no. 3 Under Contract AF 33(038)-16197. *U. S. Office of Technical Services,* PB 123584. July 1953, 9 p. (CMA)

Phases of the program which were studied in the period covered by the report were simplification of coatings, sustaining of plastic deformation at 1800° F., and gradient-temperature oxidation tests. (L general; Mo, SGA-h)

623-L. (Czech.) **Rinsing Type of Rust Removers.** M. Svoboda and B. Knapek. *Korose a Ochrana Materialu,* v. 1, no. 1, 1957, p. 3-6.

Various types of rinsing rust removers; consideration of different phosphoric acid and butyl alcohol rinses. Most convenient and active rinse is composed of 32-35% phosphoric acid and 2% butyl alcohol. 3 ref. (L12)

624-L. (Czech.) **Plating of Parts Made of Powdered Metals.** O. Mudroch. *Korose a Ochrana Materialu,* v. 1, no. 1, 1957, p. 6-10.

Expulsion of liquids trapped in pores; sealing of pores; plating by usual methods; application of various coatings; results of experiments on corrosion of plated parts. 3 ref. (L17; 6-22)

625-L. (Czech.) **Economic Analysis of Rinsing. Pt. 1.** Jan Navratil. *Korose a Ochrana Materialu,* v. 1, no. 2, 1957, p. 17-21.

Determination of optimal conditions of rinsing in a normal tank; equation for loading function of rinsing; cost of rinsing is dependent on number of items treated and content of storage tank. (L12)

626-L. (French.) **Annual Conference on Hard Chromium.** *Métallurgie et la Construction Mécanique,* v. 89, Sept. 1957, p. 745-747.

Summary of six papers submitted at the Centre Marcellin-Berthelot: influence of electrolytic polishing and hard chromium plating on fatigue resistance; technique of nondestructive metallographic examination; study of chromium-plating baths by means of radioactivity; improvement of throwing power and cathodic efficiency of chromium plating baths; influence of impurities on bright nickel-plating baths. (L17; *Cr*)

627-L. (German.) **The Al-Fin Composite Casting Process.** Eduard Betram. *Giesserei,* v. 44, Sept. 26, 1957, p. 593-602.

Properties of the Aluminum-fin layer. Applications of the process. 12 ref. (L22; Al)

628-L. (French.) **Installations for Manufacture of Tin Plate.** J. Breuzet. *Technique Moderne,* v. 49, July 1957, p. 407-412.

Properties, uses, perspectives for future use of tin plate; manufacture and characteristics of black iron intended for tin plating; tin plating methods; description of modern hot and electrolytic galvanizing equipment and operating principles; description of a "Ferrostan" line. (L17, 1-2; ST, *Sn*)

629-L. (French.) **Strip Galvanizing.** Jean Landeau. *Technique Moderne,* v. 49, July 1957, p. 413-415.

Brief notes on Sendzimir, U. S. Steel and Wheeling Steel strip galvanizing processes. Layout of a Sendzimir line and process details. Advantages of strip galvanizing. (L16; ST, *Zn,* 4-3)

630-L. (Russian.) **Pickling of Stainless Steel.** A. A. Babakov, A. A. Sabinin and I. P. Sinitsyn. *Stal',* v. 17, July 1957, p. 631-636.

Application of heat treatment to high-Cr stainless steel treated with solution of sodium chloride and nitrate renders removing of the scale much easier on subsequent pickling. (L12g; SS)

631-L. (Czech.) **Use of Flux in Hot-Dip Coating Aluminum.** L. Malek. *Korose a Ochrana Materialu,* v. 1, no. 2, 1957, p. 21-26.

Chemical properties of the various materials (borax, potassium fluozirconate and potassium fluotitanate); function of flux, technology of application of the coating. 4 ref. (L16; Al)

632-L. (German.) **Corrosion Protection of Base Metals With Chromium Plating.** Heinz W. Dettner. *Industrie-Anzeiger,* v. 79, no. 64, Aug. 9, 1957, p. 967.

Chromium dip plating procedure is cheaper and simpler than the electrolytic process and has broad field for future development. (L16; *Cr*)

633-L. (German.) **Use of Electrolytic Tinplate.** W. R. Lewis. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 456-462.

Use of continuous steel strip prepared by the cold reduction process for tinplate and the resulting reduction in coating weight; results on tinplate are more difficult in soldering and less corrosion resistance. To avoid such defects, lacquer coatings may be added to the tinplate or a combination of hot dipping and electrolytic plating used. 9 ref. (L17; ST, *Sn*)

634-L. (German.) **Oxide Formation of Precious Metals by Cathode Sputtering.** Tadasu Suzuki. *Zeitschrift für Naturforschung,* v. 12a, June 1956, p. 497-499.

Silver, gold and platinum were cathode sputtered under pressure and tested by interferometer. Silver and platinum developed oxide, but not gold. (L25h, R1h; Ag, Au, Pt)

635-L. (Italian.) **Initial Polarization of the Electrode as the Determining Parameter in the Formation of "Aluminum Blacks".** L. Guerreschi. *Chimica e l'Industria,* v. 39, Sept. 1957, p. 755-759.

Investigation of mechanism of formation of "Al blacks". Experiments and data obtained. 10 ref. (L17; Al)

Metallography

Constitution and Primary Structures

358-M. Surface Distributions of Dislocations in Metals. Pt. 2. C. J. Ball. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 977-984.

It is shown that rotation axis of a boundary containing dislocations of three systems can lie anywhere on surface of a cone; to each direction of the rotation axis there corresponds a single boundary plane. The theory cannot explain experimental evidence on misorientations in zinc unless slip occurs in nonbasal directions, or on planes not hitherto reported, at high temperatures. Experimental evidence for face-centered cubic metals is insufficiently precise to form a test of the theory. 5 ref. (M26b)

359-M. Impurity-Vacancy Interaction in a Metal. L. C. R. Alfred and N. H. March. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 985-997.

Using a generalization of model first introduced by Mott for dealing with impurities in monovalent metals, interaction between an impurity and a vacancy was studied. Detailed computations were carried out for case of copper, with a divalent impurity and a vacancy at a separation of 5 atomic units. Interaction is attractive, associated energy being calculated as 0.08(4) ev. when exchange and correlation energies are neglected. Inclusion of these effects reduces interaction energy to 0.03(3) ev. 21 ref. (M26s; Cu)

360-M. Alloys of Platinum Metals With Boron, Phosphorus and Silicon. *Platinum Metals Review,* v. 1, Oct. 1957, p. 136-137.

Eutectic temperature measurements with the hot-stage microscope. (From *Revue de Metallurgie,* v. 54, no. 5, 1957, p. 321-336.) (M24, M21; Pt, *B, P, Si*)

361-M. Composition Variation in the α-Phase Compound of the Vanadium-Aluminum System. A. E. Ray and J. F. Smith. *Acta Crystallographica,* v. 10, Sept. 10, 1957, p. 604-605. (CMA)

Previous work on the structure of the alpha-phase compound in the V-Al system is corroborated. However, while earlier samples had 10% or less of the 8(b) sites occupied by aluminum atoms, crystals investigated in the present study were found to have about 50% of the 8(b) sites so occupied. This indicates that the alpha-phase can exist over a range of composition, this composition variation arising from the varying degree of occupancy of the 8(b) sites. Composition limits of VAl_{10} and V_2Al_{21} are inferred. (M26q; V, Al)

362-M. Electron Micrographs From Thick Oxide Layers on Aluminum. C. J. L. Booker, J. L. Wood and A. Walsh. *British Journal of Applied Physics,* v. 8, Sept. 1957, p. 347-352.

Electron micrographs were obtained of pore structure in thick oxide layer formed by anodizing aluminum in sulphuric acid. Pores were shown to be minute tubes of approx. 200 A. diameter running perpendicularly through oxide and ending almost in contact with underlying metal. Pore base thickness was estimated and effect of a change in anodizing conditions on pore base is shown. 20 ref. (M27, M21e; Al, 9-18, 8-23)

363-M. Study of the Deformed Layer Produced on Metal Surfaces by Mechanical Machining, Abrasion and Polishing Operations. (Concluded.) L. E. Samuels. *Electroplating and Metal Finishing,* v. 10, Oct. 1957, p. 315-318, 343.

Polishing rates of representative methods and polishing times required for the removal of abrasion deformation in 70:30 brass specimens; maximum depth of deformed layers; variations in abrasion rates. 38 ref. (M20p, M27; Cu-n)

364-M. Nature of Mechanically Polished Metal Surfaces: Surface Deformation Produced During the Abrasion and Polishing of Zinc. L. E. Samuels and G. R. Wallwork. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 43-48.

The deformed layer produced on surfaces of polycrystalline zinc by metallographic abrasion and polishing treatments has been investigated by a taper-sectioning technique. The depth of the deformed layer resulting from various machining, abrasion and polishing treatments has been studied. 20 ref. (M20p, M27; Zn)

365-M. Effect of Edge Dislocations on Alloying of Indium to Germanium. Jacques L. Pankove. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1054-1057.

Edge dislocations and other crystal disturbances enhance dissolution of germanium in indium. Hence, under equilibrium conditions, deep alloying results, with smaller spread of indium than in case where crystal is free from these defects. Recrystallized structure over an edge dislocation differs considerably from structure at undisturbed sites. Shape of alloy front is determined by surface tension forces and tendency to terminate in (111) planes. (M26b; In, Ge)

366-M. Phase Diagram Studies of Zirconium With Silver, Indium, and Antimony. J. O. Betterton, Jr., J. H. Frye, Jr., and D. S. Easton. Oak Ridge National Laboratory. *U. S. Atomic Energy Commisssion,* ORNL-2344, Aug. 28, 1957, 52 p. (CMA)

Variation of phase boundaries arising from $\alpha \rightleftharpoons \beta$ transition can be reduced to a behavior common to other systems if a metallic valency of two is assumed for zirconium, and allowance is made for size differences in atoms. Titanium systems are compared. 24 ref. (M24b; Zr, Ag, In, Sb)

367-M. (French.) **Autoradiographic Detection of a Segregation of Traces of Sulphur in the Boundaries of Iron Annealed in the Alpha Phase.** Claude Leymonie, Pierre Coulomb and Paul Lacombe. *Comptes Rendus,* v. 245, Sept. 2, 1957, p. 931-934.

Study of specimen containing 0.003% sulphur revealed marked segregation along intergranular boundaries. This phenomenon, it is claimed, supports hypothesis of abnormal segregation of atoms of impurities in boundaries at temperatures higher than limit solubility temperature. 7 ref. (M13q, 9-19; Fe)

368-M. (German.) **Exposure Diagrams for X-Ray Film Work on Titanium and Zirconium.** K. Sagel. *Metall,* v. 11, Sept. 1957, p. 769. (CMA)

Exposure diagrams for various voltages using a distance of 60 cm. between X-ray source and film. Transformation factors for other distances, using either metal or salt intensifying foils, are also given. (M22g; Ti, Zr)

369-M. (German.) **Thermodynamic Data and Equilibrium Diagrams of Metallurgical Systems. Pt. 1.** W. Hirschwald, O. Knacke and P. Reinitzer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Mar. 1957, p. 123-127.

Calculation and tabulation of beta functions of a large number of chemical compounds which incorporate the integrals of specific heats. Equilibrium constants of a chemical reaction are calculated by simple addition of the beta functions of the participants of the reaction. (M24, P12)

370-M. (Russian.) **Electronic Structure of Nickel and Nickel Alloys.** G. S. Krinchik. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 36-40.

Definition of ferromagnetic model of nickel s-electrons explains experimental data obtained for magnetic saturation, paramagnetic susceptibility and spectrographic diffraction coefficient of several nickel alloys.

Experimental corroboration of the validity of the theoretical assumptions is demonstrated by measurement of spectrographic diffraction coefficient of Ni_3Mn alloy. 11 ref. (M25, P16; Ni)

371-M. (Russian.) **Texture of Iron Mill Scale. Pt. 9. Electrographic Investigation of Textures in Hematite Layer at Different Stages of Iron Oxidation in Air.** V. I. Arkharov and B. S. Borisov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 76-83.

Systematic electrographic investigation of the oxidation layers on iron, formed between 300 and 900° C. in time intervals from 5 min. to 48 hr. Hypothesis of the texture change on basis of oxygen and iron atoms diffusion and recrystallization of the scale. 15 ref. (M26c, R1h; Fe, 9-2)

372-M. (Russian.) **Classification of Peculiarities of Polyhedric Structure of Metals and Alloys as Observed Under the Microscope.** V. G. Vorobev. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 808-811.

General classification of metal microstructure is proposed according to size, shape and anisotropy of the grain; relief, thickness, roundness and phase dispersion of the border layer; relief, legibility, continuity, thickness and character of the grain boundary and finally according to the type of contact of more than two grains. (M27c)

373-M. (Russian.) **Metallographic Investigation of Carbide Phases of High Speed Cutting Steel.** M. S. Chaadaeva. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 811-813.

A 4% solution of sodium hydroxide, saturated with potassium permanganate, is used to detect Me_6C carbides, and MeC carbides are detected by electrolysis in 1% solution of chromic acid. (M26r; TS-m)

374-M. (Russian.) **Detection of Microstructure of Metals Using Ultraviolet Microscope.** T. G. Porokhova. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 813-817.

The method can be applied to specimens without etching if the phases differ in color at a given wave length. Photographs of AgSi, Cu-Cu_3P and FeNiCrNb alloys. (M21d)

375-M. (Russian.) **Investigation of Composition, Structure and Limits of Homogeneity of Phases in the System Vanadium-Carbon-Oxygen. Pt. 1. System Vanadium-Carbon.** M. A. Gurevich and B. F. Ormont. *Zhurnal Neorganicheskoi Khimii,* v. 2, July 1957, p. 1566-1580. (CMA)

Using chemical and X-ray methods, the region of the V-C system in the composition range between pure vanadium and VC was investigated in the temperature range 980-2300° C. The conditions of formation of gamma, delta and epsilon phases, their crystal structure and physical properties were examined in detail. Like many other carbides of transition metals, vanadium carbides show varying crystal structure. They are among the hardest known. 78 ref. (M26r; V)

376-M. (German.) **Investigations of the Partial Systems Aluminum-$TiSi_2$, -$ZrSi_2$, -$MoSi_2$ and -WSi_2.** H. Nowotny and H. Huschka. *Monatshefte für Chemie,* v. 88, Sept. 27, 1957, p. 491-501. (CMA)

A series of investigations on the basic structure of quenched alloys of the type Al-Si-$MeSi_2$ (Me = Ti, Zr, Mo, W) showed the existence of isomorphic ternary phases Mi(Si, $Al)_2$ with a C-40 structure in the case of molybdenum and tungsten. Lattice parameters for the molybdenum and tungsten systems. The ternary phases with zirconium and titanium show a similarity to ZrSi. 12 ref. (M24c; Al)

377-M. (German.) **Investigations on the Surfaces of Solid Materials by Electron Emission Microscopy.** E. B. Bas. *Planseeberichte für Pulvermetallurgie,* v. 5, Aug. 1957, p. 42-52. (CMA)

Principles of electron emission microscopy, particularly for the study of surface reactions on metals. Surface reactions occurring in the carburization of molybdenum are explained on the basis of ten micros. 2 ref. (M21e; Mo)

378-M. (German.) **High-Temperature Microscopy.** Premysl Rys. *Neue Hütte,* v. 2, Aug. 1957, p. 489-497.

Theory of high-temperature structural investigation; grain-boundary furrow formation; austenite grain growth; determination of austenite grain size; graphite layers; deformation of the polished surfaces. 7 ref. (M21, 2-12, M27; ST)

379-M. (German.) **Palladium-Iridium Alloys.** Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 444-447.

Results of X-ray and microscopic examination of platinum-iridium alloys, crystallinic behavior, hardness and high quench hardening. 2 ref. (M27, M26, Q29n; Pd, Ir)

380-M. (German.) **Deformation and Recrystallization Textures of Tin-Rich Aluminum Alloys.** Konrad Sagel. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 463-465.

Pressing, drawing and rolling textures of aluminum with 57 to 70% zinc; interpretation of the relation between the preferential orientations of the high-temperature alpha solid solution and of the two phases precipitating from it. 5 ref. (M26c; Al, *Sn*)

381-M. (Italian.) **Electronic Pattern of Metals.** Aldo Mayer. *Chimica e l'Industria,* v. 39, Sept. 1957, p. 751-754.

Brief exposition of electronic structure of metals and of Pauling's theory of the metallic bond of resonant valency; comparison of resonance in graphites and in metals. 10 ref. (M25, P18m)

382-M. (Book.) **Phase Diagrams in Metallurgy.** Frederick N. Rhines. 340 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $12.

Text for the undergraduate student presenting material on the binary, ternary, and quaternary levels. (M24)

383-M. (Book.) **Grain Boundaries in Metals.** Donald McLean, 370 p. Sept. 1957. Oxford University Press, 16-00 Pollitt Dr., Fair Lawn, N. J. $8.

Historical introduction; theories of the structure of grain boundaries; energies of interfaces; energies of grain boundaries and microstructure; equilibrium segregation at grain boundaries; sliding at and the migration of grain boundaries, special features of low-angle problems. Basic problems and numerical data. (M27f)

N Transformations and Resulting Structures

369-N. Nucleation of Crystalline Ta_2O_5 During Field Crystallization. D. A. Vermilyea. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 542-546.

Field crystallization occurs only at certain preferred nucleation sites at the metal-oxide interface. Incubation period corresponds to time required for a crystal growing underneath the amorphous oxide film to reach a critical size. Logarithm of incubation period increases linearly with decreasing eletcric field at constant temperature. 6 ref. (N12, L19; Ta)

370-N. Kinetics of Metal Deposition. T. Pavlopoulos and J. D. H. Strickland. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 568-574.

Discharge characteristics of the deposition of lead, thallium, silver, bismuth, copper, tin, and antimony ions onto the solid metals, using constant current voltammetry are reported. Parameters needed to describe deposition onto solid surfaces are discussed. 33 ref. (N12d, L17; Pb, Th, Ag, Bi, Cu, Sn, Sb)

371-N. Investigation of the Allotropic Transformation $\alpha \rightleftarrows \beta$ Zr With the Aid of an Electronic Projector. A. P. Komar and V. N. Shrednik. *Soviet Physics—JETP,* v. 5, Aug. 1957, p. 127-128. (CMA) (Translated by American Institute of Physics)

The transformation of zirconium was observed by electronic projector. The preparation of the specimen is described. The process of beta-alpha transformation was not always geometrically reversible. In all the observed cases for the mutual orientation of the crystal the original and new phases satisfied the relations found by Burgers with X-rays. The theoretical number of new orientations for transitions is not realized since the tendency is toward a minimum change in surface energy. 4 ref. (N6p; Zr)

372-N. Subgrain and Electrical Resistivity Studies of Molybdenum Single Crystals. K. T. Aust and R. Maddin. Johns Hopkins University, Report Under Contract Nonr-248(05). *U. S. Office of Technical Services,* PB 124493. July 1955, 24 p.

The conditions under which polygonization or subgrain formation occur in bent single crystals of molybdenum were studied. Electrical resistance measurements were made to get a quantitative idea of the changes during recovery and polygonization. (N3, N4, P15g; Mo, 14-11)

373-N. Effect of Stress on the Recrystallization of Lead During Creep. R. C. Gifkins. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 15-16.

Strain necessary to initiate recrystallization during creep of high-purity lead has been determined for the range of stresses from 300 to 1500 psi. (with constant loads). Results appear to be best fitted by an exponential law, recrystallization occurring at higher strains with higher stresses. 6 ref. (N5, Q3, 3-16; Pb)

374-N. Dynamic Solution - Rate Studies of Solid Metals in Liquid Metals. A. G. Ward and J. W. Taylor. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 36-42.

Study of the kinetics of solution of solid copper in liquid lead and bismuth under dynamic conditions in the range 360-460° C. Complete concentration-time curves were determined for the copper-lead and copper-bismuth systems at two temperatures. 4 ref. (N12p; Cu, Pb, Bi)

375-N. Kinetics of Zirconium-Uranium Dioxide Reaction. M. W. Mallett, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1028, Aug. 15, 1955, 64 p. (CMA)

Data indicate that zirconium jacket walls next to uranium dioxide would undergo destructive embrittlement in 300 days at 1300° F. and 2.5 days at 2000° F.
(N1, Q26s, Zr, U)

376-N. Fabrication of Zircaloy-2 Clad U-Mo and U-Nb Rods for Irradiation in the Materials Testing Reactor. W. B. Haynes. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-1105, Oct. 31, 1955, 50 p. (CMA)

Zircaloy-2 clad fuel elements were subjected to irradiation to study the diffusion zones formed between cladding and fuel. Some areas of the zones are not corrosion resistant and corrode quickly if under a fault in the cladding. It is therefore desirable to minimize diffusion to a degree consistent with a good metallurgical bond.
(N1h, 2-17; Zr, U, 8-16)

377-N. Magnesium - Zirconium Diffusion Studies. L. S. DeLuca, H. T. Sumsion and D. D. Van Horn. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission,* KAPL-1746, Apr. 1, 1957, 27 p. (CMA)

The rate of interdiffusion between magnesium and zirconium in the 500-640° C. range was studied by metallographic methods. Magnesium embrittled zirconium but did not change the microstructure. Zirconium diffusion into magnesium forms two zones. 8 ref. (N1e; Mg, Zr)

378-N. Zirconium-Uranium Dioxide Reaction. M. W. Mallett, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1210, July 22, 1957, 67 p. (CMA)

The solid-solid reaction between zirconium and UO_2 was studied with sandwich-type elements in the 750-2000° F. range in which months of heating were needed to produce measurable reaction rates. At 1300° F., rates were measurable in one month, and above 1600° F., in a few hours. UO_2 goes into zirconium as uranium and oxygen, diffusing at unequal rates. 13 ref.
(N1, 2-12; Zr, U)

379-N. Preferred Orientations and Kinetics of Recrystallization in Titanium. C. J. Sparks, Jr., and J. P. Hammond. Wright Air Development Center, Technical Report 56-421. *U. S. Office of Technical Services,* PB 121693, July 1956, 73 p. (CMA)

Preferred orientations were produced in titanium by cold rolling and cross rolling and in Ti-Al alloys by cold rolling. They were then annealed and reorientations were studied with an X-ray diffractometer. The process of recovery and recrystallization occur almost simultaneously for cold rolled titanium. Both Ti-Al and titanium had a predictable variation of yield strength in the rolling direction by applying the law of critical resolved shear to the pole figures. Kinetics, grain growth, hardness and line breadth recovery were studied.
(N5, N4; Ti)

380-N. Investigation of a New Method for the Determination of the Coefficients of Surface Diffusion of Metals. P. F. Mataich. Horizons, Inc. (Air Force Office of Scientific Research.) *U. S. Office of Technical Services,* PB 121956, Sept. 1956, 65 p. $1.75.

Three methods for determining surface diffusion coefficients were evaluated, each with a basically different type of measurement. An optical method followed height changes of a diffusing strip using interferometric measurements. An autoradiographic technique utilized photographic processes to trace progress of diffusing atoms. An electrolytic method used a solid electrolyte to transform mass flow of diffusing atoms into an electric current. The interferometric method was found to give consistently reproducible results with a very flat base surface. (N1a, 1-3)

381-N. (English.) **On the Magnetic Aging of Commercial Pure Iron.** Mitsuru Asanuma and Shinji Ogawa. *Physical Society of Japan, Journal,* v. 12, Aug. 1957, p. 955-958.

Origin of magnetic aging is explained in terms of initial magnetic susceptibility and internal friction and is credited to very small amounts of carbon and nitrogen in iron, effect of nitrogen being the more marked. Magnetic aging occurs principally during formation of intermediate nitride. Reasons are suggested for different effects of carbon and nitrogen. 14 ref.
(N7a, P16; Fe-a)

382-N. (French.) **Isotope Exchange and Evolution on Metal Surfaces in Electrolytic Solutions.** U. Camerini, J. Danon and M. Malagolowkin. *Journal de Chimie Physique,* v. 54, July-Aug. 1957, p. 527-532.

Spontaneous deposits of thorium carbide on several metals were prepared on basis of solutions containing metal ions. Autoradiography of deposits was carried out by Ilford C-2 nuclear emulsions. Statistical distribution of path of alpha rays in emulsion revealed that during isotope exchange between metal and its ions a fraction of the radioactive atoms penetrate inside the metal. Depth of penetration was calculated on basis of statistical distribution of path. This penetration is attributed to alterations undergone by metal surfaces during exchange process. 14 ref. (N12d)

383-N. (French.) **Investigation of the Intermetallic Diffusion Phenomena in the System Uranium-Zirconium.** Y. Adda, J. Philibert and H. Faraggi. *Revue de Metallurgie,* v. 54, Aug. 1957, p. 597-610. (CMA)

Investigations reveal an extremely pronounced Kirkendall effect. This implies that the intermetallic diffusion mechanism in this system is in accordance with the recent results obtained with beta-brass and with the Ti-Mo system, and more generally with metals of face-centered cubic structure. A vacancy mechanism of diffusion in these systems seems to be the case, rather than the ring mechanism suggested by Zener and LeClaire. 20 ref. (N1e; U, Zr)

384-N. (Russian.) **Diffusion in Alloys of Titanium With Columbium.** N. V. Grump Grzhimailo. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh Nauk,* no. 7, July 1957, p. 24-28. (CMA)

Study of various aspects of diffusion in multiphase crystalline bodies using tablets prepared of compressed mixtures of powdered titanium and columbium and covered with a layer of powdered titanium irradiated so as to produce a titanium isotope (half-life several seconds) which decays into beta-radioactive scandium^{46} (85 days).
(N1e; Ti, Cb)

385-N. (Russian.) **Study of Carbon Diffusion in Nickel and Its Alloys Using Radioactive Isotope C14.** P. L. Gruzin, Yu. A. Polikarpov and G. B. Fedorov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 94-102.

Detailed results of investigation of carbon diffusion in nickel, nickel-chromium and nickel-molybdenum alloys. Method of determination of carbon diffusion constant. 3 ref.
(N1; Ni, C)

386-N. (Russian.) **Relaxation of Stresses in Aluminum-Magnesium Alloys.** M. G. Gaidukov and V. A. Pavlov. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 123-130.

Relaxation of stresses of Al-Mg alloys in the range of 100-300° C. and at initial strain of 300 g. per sq. mm. Al-Mg alloys show greater relaxation firmness in comparison with pure aluminum. This is explained by deformation of crystalline structure due to pressure of the magnesium atoms and their diffusion under load and not by the increase of inter-atom binding forces. 4 ref. (N4; Al, Mg)

387-N. (Russian.) **Mechanism of Nodular Graphite Formation in Cast Iron.** I. E. Bolotov, V. I. Syreishchikova and S. G. Guterman. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 177-180.

Conditions of formation of nodular graphite. Redistribution of sulphur in nodular and flake graphite. Influence of radioactive Ca_{45} upon formation of nodular graphite. 14 ref. (N8s; CI-r)

388-N. (German.) **Measuring Technique for Kirkendall Effect in Metals.** W. Karger. *Zeitschrift für Physikalische Chemie,* v. 12, July 1957, p. 8-12.

Enables a continuous tracing of effect during experiments and precise quantitative determination of change in process itself. (N1, 1-4)

389-N. (Japanese.) **Grain Size Control and Some Property Changes of Al-Mn Alloy Sheet During the Manufacturing Process.** Eiichi Hata and Katsuzi Takeuchi. *Sumitomo Metals,* v. 9, Apr. 1957, p. 1-13.

Experiments to show the effect of impurities and preheating on grain size of Al-Mn alloy sheets. Recrystallized grains were refined and reduced in size and mechanical properties were improved when the ingot was heated prior to hot rolling; addition of iron refined the grain while presence of silica reduced the iron effect; annealing and cold rolling of hot rolled plate caused a difference in grain size at the surface. 6 ref. (N3, 2-10; Al, *Mn,* 4-3)

390-N. (Russian.) **Use of Rare-Earth Elements for Preventing the Formation of "Whiskers" During the Crystallization of Steel.** V. M. Tageev and Yu. D. Smirnov. *Stal',* v. 17, Sept. 1957, p. 823-828. (CMA)

The formation of "whiskers" (i.e., accumulations of sulphur, and other impurities), due to differences of solubility in the solid and liquid phases of solidifying steel, can be effectively avoided by treating liquid steel with a mixture of rare earth elements (cerium, lanthanum, etc.) in amounts of 0.10-0.020%. In the presence of these elements the separation of sulphide phases occurs at earlier stages of crystallization and is thus more uniformly distributed. (N12, 2-10; ST, AD-p, EG-g)

Physical Properties

385-P. Electrical Characteristics of a Nickel - Chrome - Aluminum - Copper Resistance Wire. C. Dean Starr and T. P. Wang. *Institution of Electrical Engineers, Proceedings. Radio and Electronic Engineering, (Including Communication Engineering),* v. 104, Pt. B, no. 17, Sept. 1957, p. 515-518.

Changes in resistance and temperature coefficient of resistance during heat treatment of alloy known as Evanohm. From nature of resistance-temperature curve and X-ray diffraction data it is proposed that electrical changes be attributed to short-range order. Data show that both mean temperature coefficient of resistance and minor deviations in linearity in resistance-temperature curve vary in systematic manner during heat treatment and that changes are independent of prior thermal history. Resistance changes after heat treatment, caused by either surface tarnishing, oxidation or application of strain during fabrication, are discussed. 3 ref. (P15g, 2-14; Ni, Al, Cr, Cu, SGA-r)

386-P. Theory of Ferromagnetism of Metals and Alloys at Low Temperatures. E. S. Kondorski and A. S. Pakhomov. *Soviet Physics—JEPT,* v. 5, no. 2, p. 269-276. (Translated by American Institute of Physics.)

Formulas are obtained for temperature dependence of spontaneous magnetism near absolute zero for ferromagnetic lattice consisting of one kind of atoms in case in which number of electrons with uncompensated spins is greater than number of atoms, and for lattice of binary ordered alloys of various structures. In the calculation, use is made of method of approximate second quantization. It is shown that, in all cases considered, the theory leads to temperature dependence of spontaneous magnetization of the form of a 3/2 power law. 8 ref. (P16, 2-13)

387-P. Vapor Pressure of Thulium Metal. F. H. Spedding, R. J. Parton and A. H. Daane. *American Chemical Society, Journal,* v. 79, Oct. 5, 1957, p. 5160-5163. (CMA)

Vapor pressure was measured in the range 809-1219° K., using modifications of the Knudsen effusion method. Results obtained can be expressed by the relation log P(mm.) = $(-1.2552 \pm 0.0045) \times 10^4/T - 9.1761 \pm 0.0457$. A heat of sublimation of -57.44 ± 0.20 k-cal. is indicated for the temperature range investigated. 11 ref. (P12c; Tm)

388-P. Doubly-Oriented Magnetic Sheet Will Increase Efficiency of Electrical Equipment. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 154-157.

"Four square" silicon iron developed at General Electric Research Laboratory. (P16; SGA-n, Fe, *Si*)

389-P. Performance of Composite Peltier Junctions of Bi_2Te_3. Theodore S. Shillidan. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1035-1043.

Experimental Peltier refrigerator utilizing thermo-elements of annular configuration was constructed. Thermo-electric materials used were p and n-type Bi_2Te_3. A simple theory relating to performance of Peltier thermocouples was derived. Experimental performance of device is shown to agree with theoretical predictions within experimental errors. 15 ref. (P15p, X9q, 17-7; Bi, Te)

390-P. Atomic Heats of Titanium, Zirconium and Hafnium. N. M. Wolcott. *Philosophical Magazine,* v. 2, Oct. 1957, p. 1246-1254. (CMA)

The specific heats (electronic and lattice contributions) were measured in the 1.2-20.0° K. range. The temperature variation of the Debye temperature is similar for the three metals if a suitably reduced temperature scale is used. (P12r; Ti, Zr, Hf)

391-P. Zirconium-Water Reactions. B. Lustman. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-137, Dec. 1, 1955, 39 p. (CMA)

The heating curve of Zircaloy in a reactor core and the cooling curve of molten droplets in water were determined. With zero heat loss a self-sustaining reaction between Zircaloy-2 and steam is possible. A low cooling rate suffices to prevent heating up. The core and droplet reactions are sensitive to the rate of heat dissipation, access of reactants and hydrogen blanketing. 12 ref. (P12; Zr, NM-a38)

392-P. (English.) Magnetic Anisotropy in Connection With Rolling in the Course of Producing Single Crystals of Silicon Steel. Tadaoshi Yamashita and Eiji Tatsumoto. *Physical Society of Japan, Journal,* v. 12, Aug. 1957, p. 975.

Cause of such anisotropy investigated by optical and electron microscopy and found to be due to small pinholes or pits lining up in groups parallel to direction of rolling. (P16, N3r; ST, *Si*)

393-P. (German.) Critical Magnetic Fields of Superconducting Vanadium. G. Busch and J. Mueller. *Helvetica Physica Acta,* v. 30, no. 4, 1957, p. 230-233. (CMA)

Measurements of the magnetic permeability of extremely pure vanadium samples showed transition points in a zero field between 5.28 and 5.30° K. At absolute zero a remarkably low value of 1020 oersteds was found for the critical field. From these measurements the electronic specific heat was calculated as $(6.4 \pm 0.2)10^{-3}$ joule/mol/° K^2, rather different from the values obtained by calorimetric determinations. 6 ref. (P16q; V)

394-P. (Japanese.) Investigation of Nitrides in Cast Iron. Pt. 1. Yoshisada Ueda and C. Hisatsune. *Casting Institute of Japan, Journal,* v. 29, Aug. 1957, p. 618-621. (CMA)

Thermodynamic studies on the various nitrides in the systems Fe-C-Ti-N, Fe-C-Zr-N, Fe-C-Mo-N and Fe-C-V-N. TiN, ZrN and VN were found to be stable at room temperature, while Mo_2N was stable only at about 600° C. or higher. Below this temperature Mo_2C became more stable and only the carbide was found at room temperature. (P12, M24d; CI, *N*)

395-P. (Russian.) Effect of Radiation on the Electrochemical Activity of Zirconium. I. L. Rozenfel'd and E. K. Oshe. *Akademiya Nauk. S.S.S.R., Doklady,* v. 114, May 1, 1957, p. 143-145. (CMA)

Sudden and intense rises of electric current in the electrolyte (3% NaCl) were observed when the zirconium cathode was irradiated with high-energy electrons. The current, which reached values 15-20 times as high as the current before the irradiation, dropped to the initial value as soon as the irradiation ceased. The effect is attributed to changes in the electrochemical activity of zirconium due to formation of semiconducting films which are known to respond to outside stimuli by important changes of physical properties, such as electrical conductivity. (P15, 2-17; Zr)

396-P. (Russian.) Thermal Behavior of Spontaneous Magnetization of Nickel Alloys in Neighborhood of Curie Point. K. Belov and Ya. Paches. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 48-53.

Curves of spontaneous magnetization in respect to temperature are determined by three different methods for nickel and nickel alloys; a most reliable way of determination of Curie temperature is proposed. 4 ref. (P16d; Ni)

397-P. (Russian.) Magnetic Properties of the Self-Ordering Alloy-Fe_3Al. V. I. Ivanovskii. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 70-75.

Magnetic properties of Fe_3Al alloy in respect to temperature. Kinetics of force of coersion and magnetic density in the process of self-ordering of the alloy. Receptivity of the alloy at order-disorder transition temperature. 5 ref. (P16, N10; Fe, Al)

398-P. (Russian.) Investigation of Tendency of Cast Iron to Swell. N. N. Popova and N. A. Kravchenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 817-818.

Apparatus whereby any irreversible volume changes of cast iron on prolonged heating can be measured. (P10d, 1-3; CI)

399-P. (English.) Electrical Properties of P-Type Indium Antimonide. Tadao Fukuroi and Chikako Yamanouchi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 262-265.

Electrical properties of P-type InSb from ambient to liquid helium temperatures are measured and several parameters associated with the charge carries are obtained. 3 ref. (P15, 2-13; In, Sb)

400-P. (English.) Relationship Between the Hall Coefficient and the Resistivity of Semiconductors, Taking Various Scattering Mechanisms of the Charge Carriers Into Account. Tadao Fukuroi and Chikako Yamanouchi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 267-272.

Jones has given an expression for the Hall coefficient of semiconductors taking into account both the thermal and the ionized impurity scattering of electrons (or holes) in a band. As temperatures decrease, the influence caused by neutral impurity scattering and dislocation scattering becomes appreciable. Taking into consideration every two scattering mechanisms out of four mechanisms mentioned above, the relations between the Hall coefficient and the resistivity are calculated in a way analogous to that of Jones. 5 ref. (P15g)

401-P. (English.) The de Haas-van Alphen Effect of Zinc. Tadao Fukuroi

and Yoshitami Saito. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 273-292.

In a magnetic field of less than 16 kilo-oersteds and at a temperature of 4.2° K. and above, a remarkable periodic variation of magnetic susceptibility was found, and it is referred to as the long-period effect. (P16; Zn)

402-P. (English.) **Magnetization, Magnetostriction and Relaxation Phenomena During Isothermal Magnetic Annealing at High Temperatures in Ni-Co Alloys.** Hakaru Masumoto, Hideo Saito and Minoru Takahashi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 293-308.

An apparatus for the precise measurement of magnetostriction and magnetization at high temperatures was constructed, and these magnetic properties in nickel-cobalt alloys thermally demagnetized were measured at high temperatures. These properties showed a remarkable relaxation phenomenon. Their time changes at constant temperature were continuously traced under the external fields of various strengths from the instant of the application of the field onward.
(P16, 1-3; Ni, Co)

403-P. (German.) **Demonstration of Galvanomagnetic Effects in Metals and Semiconductors.** E. Saur. *Praxis der Physik/Chemie Photographie,* v. 6, July 15, 1957, p. 173-177.

Importance of Hall effect in explanation of conducting current mechanism. It lies in proof of "defective electrons", conductivity in conductors with positive Hall effect, and in possibility of determining quantitatively movements of electrons from Hall constant. 9 ref.
(P15p)

404-P. (German.) **Electrical Resistance of Metallic Melts. Pt. 2. Copper-Tin, Silver-Tin and Magnesium-Lead Alloys.** Albert Roll and Hasso Motz. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 435-444.

Melts of certain intermetallic solid compounds have an unexpected high electrical resistance and small temperature coefficient. In the systems silver-tin and copper-tin, other resistance anomalies have been found which are not connected with occurrence of intermetallic phases in solid metallic compounds. 27 ref.
(P15g; Sn, Cu, Ag, Mg, Pb, 14-10)

405-P. (German.) **Electron-Optical Study of Processes in Strained Nickel Wires.** Christoph Schwink. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 466-470.

Electron-optical method for measuring of pole points in magnetized wires; shift of pole points during straining and etching of nickel wires; definition of polycrystalline yield strength; thermal recovery and drawn-wire experiments. 15 ref.
(P16, Q21; Ni, 4-11)

Q Mechanical Properties and Tests

1007-Q. Ceramic Coatings vs. Creep Rates. *Ceramics,* v. 9, Sept. 1957, p. 21-22.

Study of creep behavior under different temperature-stress conditions of some alloys (including two 80-20 Ni-Cr alloys) coated with refractory-type ceramic materials indicated that under some conditions coating can reduce creep rate as much as 50% while under others a deleterious effect is observed. (Q3n; 8-21)

1008-Q. Steel for Canadian Pipelines. M. A. Scheil, G. E. Fratcher, S. L. Henry and E. H. Uecker. *Mechanical Engineering,* v. 79, Sept. 1957, p. 853-857.

Reports on hydrostatic burst tests at subzero temperatures made on commercial semikilled steel pipe of various diameters and wall thicknesses. Data on pipe performance and hydrostatic burst including strength, circumferential stretch, fracture type and shattering tendencies.
(Q10b, 2-13, T26r, 17-7; ST)

1009-Q. The Future of High-Temperature Metallurgy. L. P. Jahnke. *Metal Progress,* v. 72, Oct. 1957, p. 113-118.

Future advances must be conceivable, feasible and desirable. On this basis the author considers the effect of purity (both chemical and structural), especially of alloys based on columbium, molybdenum or tungsten, and predicts that by A.D. 2000 we will have alloys of useful strength up to 5500° F.
(Q27a, 2-12; SGA-h)

1010-Q. Some Properties of Nickel-Base Casting Alloys for High-Temperature Service. D. R. Wood and J. F. Gregg. *Metal Treatment and Drop Forging,* v. 24, Aug. 1957, p. 317-324.

Tensile impact, hardness and stress-rupture properties at room temperature and rupture properties at high temperatures of six nickel-base chromium-containing castings made in sand or investment molds. Casting characteristics and factors affecting casting qualities. (Q general, 2-12; Ni, SGA-h, 5-10, 5-12)

1011-Q. Experimental Study of the Mechanism of Plastic Deformation in Metal Cutting Compared With the Methods of Classical Stressing. Paul Bastien and Michel Weisz. *Microtecnic,* v. 11, No. 3, 1957, p. 122-129.

Following tests were conducted parallel to classical measurement of stress and deformation during cutting: static traction at ambient and various other temperatures; rapid traction at ambient and different temperatures; torsional stressing at ambient temperature; dynamic torsion stressing with and without initial hardening, with or without axial compression. (Q24, L17)

1012-Q. Effect of Metal Characteristics on Forming and Welding. Pt. 1: Forming. Lester F. Spencer. *MPM,* v. 14, Oct. 1957, p. 35-37, 64.

How to specify carbon steel sheet and strip on basis of factory designations and end use; limitations of carbon steel products for fabricating operations. (To be continued.)
(Q23q; CN, 4-3)

1013-Q. The Effects of Low Temperatures and Notch Depth on the Mechanical Behavior of an Annealed Commercially Pure Titanium. G. W. Geil and N. N. L. Carwile. *National Bureau of Standards, Journal of Research,* v. 59, Sept. 1957, p. 215-226. (CMA)

Annealed specimens of titanium in the notched and unnotched condition were strained to fracture at −196, −78, 25 and 100° C. The ductile-to-brittle transition occurs between 125—80° C.; the notch toughness retained at −196° C. is small. Lowering the temperature does not greatly affect the ability of titanium to deform under uniaxial stress, but greatly affects the ductility of titanium under multiaxial stress. The ductility of notched specimens decreased rapidly at all temperatures when the notch depth was 10%.
(Q23p, 2-13; Ti)

1014-Q. The Flow Stress of Polycrystalline Aluminum. C. J. Ball. *Philosophical Magazine,* v. 2, 8th Series, Aug. 1957, p. 1011-1017.

There is a strong correlation between flow stress and sub-grain size in polycrystalline Al deformed in tension; strength of boundaries does not appear to depend on boundary angle. Variation of flow stress with temperatures suggests that strength-controlling factor is elastic interaction. 9 ref. (Q27a, 2-9; Al)

1015-Q. Creep Testing of Platinum Alloys. F. C. Child. *Platinum Metals Review,* v. 1, Oct. 1957, p. 121-126.

An account of the Johnson-Matthey creep-testing laboratory for determining life-to-rupture under constant stress at temperatures from 400 to 900° C., using miniature creep-testing machines. Experimental results. 9 ref. (Q3, 1-3; Pt)

1016-Q. Formability of Flat Spring Material. John B. Beckwith. *Product Engineering,* v. 28, Sept. 16, 1957, p. 125-127.

Data on formability, tensile strength and hardness of spring steel strip containing 0.70 to 0.80 or 0.90 to 1.05% carbon.
(Q23q; CN, SGA-b, 4-3)

1017-Q. The Production of Line Networks on Sheet Metal for the Investigation of Its Behavior During Deformation. J. H. Zaat. *Sheet Metal Industries,* v. 34, Oct. 1957, p. 737-740.

Methods by which a network of lines may be applied to the surface of sheet metal. An essentially photographic method was selected which confers such properties as high adherence, ability accurately to follow deformation, absence of notch effect and simple application. 6 ref.
(Q24, 1-4; 4-3)

1018-Q. New Lower Alloy High Speed Steels. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 504-505; 530.

Economic advantages in reduced steel cost, machining and heat treating. Bend test and torsion impact test results of MV-1 low-alloy steel.
(Q5g, Q1b; TS-m)

1019-Q. Tool Steels. L. F. Spencer. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 511-516; 526-527.

Chemical composition of representative steels; suggested steels for specific applications; hardness after tempering and effect of multiple tempering on hardness of high speed steels. Brief description of high speed grades. (Q29n, T6n, 17-7; TS)

1020-Q. Fixture for Compression Testing of Sheet Materials at Elevated Temperatures. B. L. Molander, C. R. Waldron and J. C. Newland. *ASTM Bulletin,* no. 225, Oct. 1957, p. 37-39.

A device that reduces the high-temperature factors to a minimum and yet inhibits buckling; utilizes leaf-spring guides which move easily with compressive deformation of the test specimen but offer high resistance to lateral deflection. 8 ref.
(Q28, 1-3, 2-12; 4-3)

1021-Q. Review of Sonic Methods for the Determination of Mechanical

Properties of Solid Materials. Clyde E. Kesler and Tien S. Chang. *ASTM Bulletin,* no. 225, Oct. 1957, p. 40-46.

The mechanical properties most often determined by sonic testing are the modulus of elasticity in compression, tension and shear, from which Poisson's ratio can be computed. In some methods, a measure of the viscosity of the material may be determined and expressed as damping capacity or as logarithmic decrement. 37 ref.
(Q21, P10f, Q8g, 1-24)

1022-Q. Porosity in Formed Titanium. R. A. Wood, D. N. Williams, H. R. Ogden and R. I. Jaffee. *Battelle Memorial Institute,* TML Report No. 72, May 17, 1957, 36 p.

A new type of material failure has been found in parts formed of commercial-purity titanium. Surface pitting and internal voids are formed in areas of the part which have been highly strained. The phenomenon has been named strain-induced porosity. 6 ref.
(Q23q; Ti, 9-18)

1023-Q. Fatigue Characteristics of a Riveted 24S-T Aluminum Alloy Wing. Pt. 3. Test Results. J. L. Kepert, C. A. Patching, M. R. Rice and J. G. Robertson. *Commonwealth of Australia, Aeronautical Research Laboratories,* Report ARVSM.248, Oct. 1957, 43 p., 24 full-page figures.

Fatigue tests were conducted on 178 specimens from 90 P-51D Mustang wings. Tabulation of fatigue life, type of failure and load range for each specimen. Crack propagation rate, local strain distribution, types of fatigue failure, effect of preload and variation in structural flexibility. 14 ref. (Q7; Al, 7-3)

1024-Q. Tensile Tests on Titanium. Control of Strain Rate. R. J. Parker. *Engineering,* v. 184, Sept. 27, 1957, p. 392-396. (CMA)

Commercial titanium and a Ti-Al-Mn alloy by ICI were subjected to tensile testing at strain rates up to 1 in. per in. per hr. The testing program conformed to a theoretical relationship between strain rate and speed of tensile testing, the derivation of which is included. 12 ref.
(Q27, 3-17; Ti)

1025-Q. Plastic Deformation of Aged Aluminum Alloys. G. Thomas and J. Nutting. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 7-14.

The electron microscope was used to study the metallography of the slip characteristics of aged and plastically deformed aluminum alloys containing 4% Cu and 7% Mg respectively. Microstructural changes during aging are shown. 15 ref. (Q24a, N7a, M21e; Al)

1026-Q. Structural Changes Caused by Plastic Strain and by Fatigue in Aluminium-Zinc-Magnesium-Copper Alloys Corresponding to D.T.D. 683. T. Broom, J. A. Mazza and V. N. Whittaker. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 17-23.

High-purity aluminum alloys containing 6% Zn, 3% Mg and 1% Cu have been used for metallographic investigations of tensile and fatigue phenomena. In alloys treated to an ultimate strength of about 40 tons per sq. in. with about 10% elongation, catastrophic softening on certain planes can be observed in the late stages of both tensile and fatigue tests. 19 ref.
(Q27a, Q7a, 3-18; Al, *Zn, Mg, Cu*)

1027-Q. Young's Modulus of Some Quenched and Aged Binary Aluminium Alloys. B. J. Elliott and H. J. Axon. *Institute of Metals, Journal,* v. 86, Sept. 1957, p. 24-28.

Variation of Young's modulus with composition for a series of binary aluminum-rich solid solutions containing Si, Cu, Ag, Au and Mg in the as-quenched and also in the aged condition. Some results are also reported for duplex aluminum alloys. 9 ref. (Q21a, 2-10, 2-14; Al)

1028-Q. Low-Temperature Impact Properties of Cast Steel. W. J. Jackson and G. M. Michie. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 104-120.

Charpy V-notch and keyhole tests were carried out over a range of temperatures on steels in various conditions of heat treatment, and the V-notch impact transition curves were drawn. Hardness tests were also made at subzero temperatures. 12 ref. (Q6n, Q29n, 2-13; ST, 5)

1029-Q. Titanium and Its Alloys. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 106-107. (CMA)

Physical, mechanical, fabricating and corrosion resistant properties are tabulated for titanium, Ti-3Al-5Cr, Ti-5Al-2.5Sn, Ti-6Al-4V, Ti-2.2 Fe-2.1Cr-2Mo, Ti-8Mn, Ti-3Mn-1.5Al and Ti-4Mn-4Al. Annealing and stress-relieving treatments and available forms. (Q general, P general, 17-2, R general; Ti)

1030-Q. Titanium Alloy Has Guaranteed Tensile Strength of 170,000 PSI. *Materials in Design Engineering,* v. 46, Oct. 1957, p. 180-181, 183. (CMA)

Ti-155A has a guaranteed tensile strength after heat treatment of 170,000 psi. and is claimed to be one of the strongest titanium alloys available in the mill annealed condition. Optimum heat treatments for this alloy. (Q27a, J27; Ti)

1031-Q. Ductility of Magnesium. *Metal Industry,* v. 91, Oct. 11, 1957, p. 319-320.

Crystallographic phenomena relating to magnesium under plastics deformation. (Q23p, Q24; Mg)

1032-Q. Parts Made of Selected High Strength Cast Steels. Robert J. Ely. *Precision Metal Molding,* v. 15, Nov. 1957, p. 39-40, 96-97, 108-109.

Properties of investment casting of high-strength steel.
(Q general; ST, 5-12)

1033-Q. Test Results Guide. High-Temperature Design of Bolted Assemblies. Steven S. Silwones and Robert A. Degen. *Product Engineering,* v. 28, Sept. 30, 1957, p. 79-83.

Stress-rupture strength, short-time tensile strength, coefficient of thermal expansion, notched sensitivity data for 7075-T6 aluminum, 4140 and 8740 steels, 17-7PH, 17-4PH and 422 modified stainless steels, A-286 alloy, Inconel X and 6AL-4V titanium; data on 100-hr. relaxation tests with bolt and locknuts from above materials. (Q general, P11g; SGA-h, Al, ST, SS, Co, Ni, Ti, 7-4)

1034-Q. The Normal Elastic Modulus of Alloys of Zirconium With Niobium. Yu. F. Buchkov, A. N. Rozanov and D. M. Skorov. *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 171-175. (CMA) (Translated by Consultants Bureau, Inc.)

Measurements of the normal elastic modulus up to 950° C. and at room temperature after various heat treatments. The elastic modulus of Zr was lowered by the addition of Cb, but the decrease in elastic modulus with temperature is much smaller for Zr-Cb alloys than for pure iodide zirconium.
(Q21a, 2-10; Zr, *Cb*)

1035-Q. Some Properties of Alloys of Zirconium With Niobium. Yu. F. Buchkov, A. N. Rozanov and D. M. Skorov. *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 165-170. (CMA) (Translated by Consultants Bureau, Inc.)

Phase diagram is shown for the system Zr-Cb. Measurements of tensile strength and elongation at room temperature, and an estimate of high-temperature strength on the basis of hardness measurements up to 750° C. 5 ref.
(Q27a, 2-12, M24; Zr, *Cb*)

1036-Q. Test Reduces Overdesign Problem. *Steel,* v. 141, Oct. 7, 1957, p. 184-192.

New impact testing procedure measures properties of slack quenched steels. (Q6, 1-4; ST; 14-19)

1037-Q. Mechanical Properties of Alloys of the Uranium-Zirconium System. G. T. Muehlenkamp, W. Chubb and A. D. Schwope. *U. S. Atomic Energy Commission,* TID-10047, Oct. 20, 1953, 10 p. (CMA)

Induction-melted and arc-melted zirconium-uranium alloys were tested for tensile properties at 70 and 700° F. and for dynamic Young's modulus up to 1000° F. In general the zirconium-rich end of different phase fields was stronger, except for the $\varepsilon + \beta$ phase region. Elongation increased rapidly in the latter. The modulus of elasticity decreased as the zirconium content increased.
(Q21, Q27a, M24b; U, Zr)

1038-Q. Impact Tests of Zircaloy 2-Hafnium Welds. H. R. Hoge. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-215, Dec. 30, 1953, 11 p. (CMA)

Tests show that the impact values for Zircaloy 2-hafnium welds increase with temperature up to 500° F.; beyond this point no breakage occurred. Data curves are shaped the same for welded samples and for solid metal samples. All the materials tested are stronger than crystal-bar zirconium. Prior heat treatment gave no advantage.
(Q6n; Zr, Hf, 7-1)

1039-Q. Effects of Neutron Bombardment Upon the Properties of Zircaloy-2. M. L. Bleiberg. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-MDM-10, May 19, 1954, 15 p. (CMA)

Property changes in Zircaloy-2 after irradiation in the MTR. Electrical resistivity increased 15%, hardness increased 33 D.P.H., and notch toughness increased at high temperatures and decreased at low temperatures. 4 ref.
(Q general, P15g, 2-17; Zr)

1040-Q. Endurance Tests on SAR Zircaloy-3 Fuel Element Welds. A. B. Briggs. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-S3G-RE-507, Sept. 5, 1956, 11 p. (CMA)

An endurance testing machine was constructed to test SAR Zircaloy welds. Test results on five specimens tested to failure indicated that the quality and symmetry of the weld assembly is more significant than the number of weld passes.
(Q7; Zr, 7-1)

1041-Q. Examination of Zirconium Exposed to 190 MWD/AT. W. S.

Kelly. Hanford Works. *U. S. Atomic Energy Commission*, HW-34820, Feb. 1, 1957, 7 p. (CMA)

Cold worked zirconium was irradiated to determine effects of exposure time on tensile properties, hardness and metallography. Lesser cold work gave about the same grain size although more twinning occurred with higher cold work. At about 30% cold work, larger grains begin to appear which grow still larger and more numerous with more cold work.
(Q27a, Q29n, M27, 2-17; Zr)

1042-Q. Interim Progress Report on the Creep-Rupture Properties of Zircaloy. Pt. 1. Extruded and Annealed Zircaloy-3. R. L. Mehan and F. W. Wiesinger. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-M-RLM-11, May 29, 1957, 16 p. (CMA)

Creep-rupture tests of extruded and annealed Zircaloy-3 at 600, 700 and 800° F. helium protective atmosphere. Curves of rupture strength, minimum creep rate and ductility values. Ductility showed no decrease with increasing time under load and increased with temperature. (Q3m; Zr)

1043-Q. Creep Properties of Metals Under Intermittent Stressing and Heating Conditions. Pt. 2. Intermittent Heating. L. A. Shepard, et al. University of California. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131016, July 1954, 38 p. $1.00.

Intermittent heating, constant creep tests on aluminum alloys, clad 75S-T6 and clad 24S-T3. In the absence of solid state reactions, creep under intermittent heating conditions can be predicted from ordinary isothermal creep data. Equal creep strains are produced in equal net times at test temperature in intermittent heating and isothermal creep testing. Thus intermittent heating creep strains at any time may be estimated by summing the net time at test temperature and determining the strain for an equal time from an isothermal creep test. (Q3)

1044-Q. Minutes of Physical Metallurgy Symposium. Ordnance Department, Metallurgical Advisory Committee on Titanium. *U. S. Office of Technical Services*, PB 131105, Sept. 1955, 72 p. (CMA)

Symposium of 21 papers dealing with titanium alloy phase diagrams and transformation phenomena, mechanical properties of titanium and titanium alloys, and the effect of hydrogen and other interstitials on titanium. (Q general, M general, N general; Ti)

1045-Q. Investigation of Alloys of Magnesium and Their Properties. G. D. Foerster, et al. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121801, Nov. 1956, 93 p. $2.50.

Development of improved magnesium wrought alloys for room and high-temperature service.
(Q general, 2-12; Mg)

1046-Q. Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating. J. D. Morrison and J. R. Kattus. Southern Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121812, Nov. 1956, 199 p. $4.75.

Effects of variations in strain rate and holding time on the tensile properties of several metals after heating within 10 sec. to temperatures to 1200° F. Primarily directed toward effects on yield and ultimate strength. (Q27a, 3-17, T24a)

1047-Q. Creep Behavior of Magnesium Alloys. G. W. Pearsall and C. S. Roberts. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121977, Dec. 1956, 24 p. $1.

Fundamental study of the mechanisms involved in tertiary creep in magnesium alloys. Sublimed magnesium was used as the test material. Emphasis was placed on obtaining intercrystalline failure, since creep failure in most commercial alloys occurs in this manner.
(Q3; Mg)

1048-Q. Intermittent Stressing and Heating Tests of Aircraft Structural Metals. J. Salvaggi. Cornell Aeronautical Laboratory, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131210, May 1957, 76 p. $2.

C-110M titanium, A-70 titanium, type-321 stainless, N-155 alloy and 4130 steel were evaluated under conditions of combined intermittent temperature and load. Analysis disclosed little difference in creep and rupture behavior relative to the intermittent-load or intermittent-heat results. Basic mechanisms appear to be unaffected by the phase relationships of the combined cyclic-load and temperature conditions of the study.
(Q3, T24a, 17-7; Ti, SS, Co, AY)

1049-Q. (German.) **Development of Internal Stresses During the Casting of Cylinder Heads.** Kurt Bandow. *Geisserei*, v. 44, Sept. 26, 1957, p. 579-582.

Execution and results of measurements; effect of the shape of the cylinder heads on the magnitude of the internal stresses. (Q25, E25)

1050-Q. (German.) **Investigations on the Surface Hardenability of Different Types of Cast Iron.** Hans Schiffers, Dieter Ammann and Erich Brugger. *Geisserei*, v. 44, Sept. 26, 1957, p. 583-588.

Investigations of plain and low-alloy cast iron; effect of alloying elements on hardness; causes of surface defects. 7 ref.
(Q29a, 2-10; CI, 9)

1051-Q. (Italian.) **Measurement of Static and Dynamic Stresses.** *Metallurgia Italiana*, v. 49, July 1957, p. 494-508.

Types, applications, techniques of use of extensometers and electric dynamometers; determination of stresses by photo-elasticity; Drucker method of photo-elastic measurement; surface photo-elasticity; photo-elasticity of transparent tape; use of brittle coatings and X-ray techniques for stress analysis; optical measurement of displacements; problems of measurement of internal stresses. 25 ref. (Q25, X28, 1-2)

1052-Q. (Italian.) **Note on the Concentration of Stresses in Elliptical Fillets.** A. Erra. *Metallurgia Italiana*, v. 49, July 1957, p. 509-517.

Behavior of elliptical fillets under bending and tensile stresses was investigated. Theoretical factors of stress concentration were calculated by means of photo-elasticity; effective factors were determined by means of fatigue tests on specimens of normalized carbon steel and hardened and tempered Cr-Ni-Mo steel. Experimental results showed that elliptical fillets can, within clearly defined limits, reduce concentration of bending stresses; that they offer no advantage as regards tensile stresses. 5 ref.
(Q25k; CN, AY)

1053-Q. (Italian.) **Statistical Theory of Fatigue.** A. Ferro and R. Colombo. *Metallurgia Italiana*, v. 49, July 1957, p. 518-522.

Analytical study of S-N curves and Freudenthal theory of fatigue failure, plus analysis of reported results of fatigue tests by other researchers; designed to contribute to solution of problem of whether or not a fatigue limit actually exists. 19 ref. (Q7, S12)

1054-Q. (Italian.) **Fatigue Limit and Size Effect With Particular Reference to Case of Alternating Tensile-Compressive Stresses.** A. Pasetti. *Metallurgia Italiana*, v. 49, July 1957, p. 523-530.

Principal theories advanced to date in explanation of size effect are reviewed, theory of stress gradients being termed most logical. Results of series of push-pull tests on different sized plain and notched specimens of a C20 normalized steel are presented and analyzed on basis of this preferred theory; possibility is suggested of predicting fatigue limit of large parts theoretically. 10 ref. (Q7a; CN)

1055-Q. (Japanese.) **Study of Ti-V Cast Iron.** Takeshi Yamashita and S. Maekawa. *Casting Institute of Japan, Journal*, v. 29, Aug. 1957, p. 621-623. (CMA)

Effects of titanium and vanadium additions to cast iron. Metallic titanium and ferrovanadium were added in the ladle before pouring. An improvement in hypereutectic cast iron was achieved only when titanium and vanadium were added together. Improvements noted include increase in mechanical strength, good wear resistance and increased resistance to grain growth and oxidation. 15 ref.
(Q general, 2-10, CI-q, *Ti, V*)

1056-Q. (Russian.) **Alloys of Titanium With Tungsten and Aluminum.** N. T. Gudtsov and I. P. Panchenko. *Akademiya Nauk S.S.S.R., Izvestiya, Otdelenie Tekhnicheskikh Nauk*, no. 2, Feb. 1957, p. 139-143. (CMA)

An experimental study of the possible advantages of the simultaneous presence of tungsten and aluminum in titanium alloys demonstrated advantages with regard to strength, hardness and refractoriness in alloys of titanium with 3% Al and 5, 10 and 15% W. Strength and hardness increase with tugnsten content.
(Q general, 2-10; Ti, *W, Al*)

1057-Q. (Russian.) **Internal Friction of Aluminum-Magnesium Alloys on Deformation.** A. V. Grin and V. A. Pavlov. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 103-111.

Thermal relationship of internal friction of Al-Mg alloys on deformation. New maximum of internal friction dependent on magnesium diffusion. Value of the maximum shifts at higher temperatures with increase of magnesium concentration in solid solution. 18 ref.
(Q22, 3-18; Al, Mg)

1058-Q. (Russian.) **Investigation of Deformation of Metals Under Small Strains. Pt. 1. Some Relationships of Aluminum and Copper Creep.** B. Ya. Yampolskii and T. A. Amfitea-

trova. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 131-140.

Results of investigation of aluminum and copper wire creep under different conditions of deformation. Influence of microstructure and temperature upon creep. 10 ref.
(Q3; Al, Cu, 4-11)

1059-Q. (Russian.) **Mechanism of Plastic Deformation and Mechanical Properties of Aluminum. Pt. 1. Study of Plastic Deformation Mechanism of Aluminum Based on Surface Markings on Stretching. Pt. 2. Formation of Blocks in Grains of Aluminum on Plastic Deformation.** E. S. Yakovleva. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 141-144; v. 4, no. 1, 1957, p. 145-150.

Results of deformation at −196, 18 and 250° C. and speed of 7.3 x 10^4, 73 and 2.3% per hr. Results of creep at 250° C. and speed of deformation of 0.1 and 4 x 10^{-3}% per hr. Photographs of specimens taken using microinterferometer technique; X-ray photographs and photographs in polarized light of specimens. 16 ref. (Q24; Al)

1060-Q. (Russian.) **Deformation Texture of Low-Carbon Steel on Cold Rolling.** K. V. Grigorov and G. P. Blokhin. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 161-170.

Relationship of texture development and degree of deformation. An attempt to explain the relationship considering geometry of plastic deformation of crystals on slipping. 9 ref. (Q24, M26c, CN-g)

1061-Q. (Russian.) **Change of Ductility of Transformer Steel on Cooling.** S. I. Doroshek, N. I. Lapkin and G. N. Shubin. *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 171-176.

Certain problems of the kinetics of ductility change of hot rolled transformer steel on cooling, preceded by low-temperature annealing. Influence of cooling rate and tem--perature interval upon ductility of the steel. A maximum of the ductility dependent upon heat treatment. 2 ref.
(Q23p, J23; ST, SGA-n)

1062-Q. (Russian.) **Properties of Deformed Alloys of the System Titanium-Aluminum at Elevated Temperatures.** R. H. Nikitenko. *Metallovedenie i Obratbotka Metallov,* no. 8, Aug. 1957, p. 7-14. (CMA)

The strength of technical titanium at elevated temperatures, especially up to 700° C., is notably increased by additions of aluminum. Between 300 and 450° C. there is an important drop in the relative elongation value, which becomes a rather complicated function of the temperature. This points to an acceleration in the transition from a uniform to a localized deformation. Alloys containing more than 5% Al have a pronounced tendency toward aging at 400-500° C. This is attributed to the fact that the structure of such alloys is essentially heterophase. 11 ref.
(Q27a, 2-12; Ti, *Al*)

1063-Q. (Russian.) **Influence of Impurities Upon Properties of Chromium-Nickel Heat Resistant Alloys.** M. V. Pridantsev and G. V. Estulin. *Stal',* v. 17, July 1957, p. 636-640.

Extremely detrimental influence of lead, antimony and other low-melting, immiscible metals; effect of carbon, manganese and silicon. 13 ref. (Q general, 3-19; SS, SGA-h)

1064-Q. (Russian.) **Characteristics of Steel Impact Strength in Relation to Temperature and Shape.** T. A. Vladimirski. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 830-837.

Results of impact strength testing of five grades of steel between −120 and 90° C. Notches in tested specimens were 2 mm. deep with a radius varying from 2 to 0.1 mm. 28 ref. (Q6n; ST)

1065-Q. (Russian.) **The Third Period of Creep and Stress Relaxation.** Ya. S. Gintsburgh. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 838-842.

Graphs of creep and relaxation curves as well as irreversible deformation curves of chromium, nickel and manganese steels. Investigation of stress relaxation in high-alloy steels at 550 and 650° C. 10 ref. (Q3; AY)

1066-Q. (Russian.) **The Third Period of Stress Relaxation Curve.** I. A. Oding and V. V. Burdukskii. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 843-845.

General discussion of existence of a third period of stress relaxation similar to a well-established third period of creeping. 11 ref. (Q3)

1067-Q. (Russian.) **The Initial Period of Stress Relaxation in Metals.** V. Z. Tseitlin. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 846-849.

First period of stress relaxation in steel is discussed and the graphs at 400, 450, 550 and 600° C. presented. 8 ref. (Q3)

1068-Q. (Swedish.) **New Results on the Importance of the Surface Effect in the Initiation of Fatigue Cracks.** O. Lissner. *Jernkontorets Annaler,* v. 141, 1957, p. 380-389.

Fatigue experiments on a quenched and tempered chromium-nickel-molybdenum steel confirmed the existence of a surface effect which contributes to the initiation of fatigue cracks. By nine times repeated turning of a thin surface layer the life of a fatigue test piece was increased 633%. 9 ref.
(Q7; AY)

1069-Q. (French.) **Softening and Recrystallization of Commercial Titanium Sheet.** A. Saulnier and R. Develay. *Revue de Metallurgie,* v. 54, Sept. 1957, p. 689-699. (CMA)

Effect of rate of work hardening on the mechanical characteristics and structure of commercial titanium sheet as a function of annealing conditions.
(Q general, N5, J23; Ti, 4-3)

1070-Q. (German.) **Strain in Structural Steel at High Temperatures.** Alfred Wyszominski. *Bergakademie,* no. 6, 1957, p. 312-317.

Determination of behavior of structural steel under steady load.
(Q28, 2-12; ST, SGB-s)

1071-Q. (German.) **A New Tool for Testing of Deep-Drawing Quality of Sheet Metals.** J. Rosenfeld. *Feingerate Technik,* v. 6, July 1957, p. 303-305.

Schiessl hand tongs which permit testing of material quickly on the spot without elaborate testing tools, lost time and damaged sheets.
(Q23q, 1-3, 4-3)

1072-Q. (German.) **Absorption of Ultrasonic Waves in Metals at Very Low Temperatures in Normal and Superconductive Conditions.** G. Kurtze. *Naturwissenschaften,* v. 44, no. 13, July 1, 1957, p. 368-370.

Method for determining velocity and phase of waves; theory for estimation of absorption. 3 ref.
(Q21f, 2-13)

1073-Q. (Japanese.) **Tubes for Low-Temperature Service.** Jimpei Omori, Eiji Miyoshi, Kazuo Kawano and Hidetoshi Maruoka. *Sumitomo Metals,* v. 9, Apr. 1957, p. 14-33.

Heat treatment, cold working and welding of steel. The quenched and tempered condition is most desirable and less than 10% reduction of cold working does not affect low-temperature service, but over 10% reduction reduces impact strength. A 25-20 Cr-Ni electrode is most suitable for welding. 12 ref.
(Q6n, 2-13, J general, K1; ST, 4-10)

1074-Q. (Book.) **Strength of Materials.** F. R. Shanley. 783 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $8.50.

A first text for college courses in engineering and science. Deals with data forming the basis for all types of structural analysis and design. Chapter headings include: analysis of stress, elastic and thermal strains, plastic strain, torsion, stress concentration and fatigue, and strength of joints and fittings. 105 ref. (Q general, Q25k)

1075-Q. (Book.) **Principles of the Properties of Materials.** Jacob P. Frankel. 228 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $6.

Undergraduate text emphasizing properties rather than materials. Corrosion, elasticity, plasticity and fracture are given particular attention.
(Q general, P general, R general)

1076-Q. (Book.) **Thermal Stresses.** B. E. Gatewood. 232 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $7.50.

Basic information and possible procedures for solving those problems of thermal stress associated particularly with elevated temperatures in airplane and missile structures, turbines and nuclear reactors, directed especially to the engineer and aeronautical engineer. Design problems—temperature distribution; the elastic and inelastic thermal stresses in various structures; the combined elastic and inelastic applied and thermal stresses; the allowable stresses for various materials and loading conditions; the buckling, deflection, stiffness, fatigue, shock and flutter effects of elevated temperatures. (Q25p, Q general, 2-12)

1077-Q. (Book.) **Brittle Behavior of Engineering Structures.** Earl R. Parker. 323 p. 1957. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $6.

For the engineer and metallurgist responsible for the prevention of catastrophes. Theories and mechanism of failure; review of test methods for evaluating relative brittleness; interpretations and summaries of test results; effects of welding and composition variations on notch toughness; reports of service failures. (Q26s, 1-4)

R Corrosion

421-R. Oxidation of Evaporated Barium Films (Getters). R. N. Bloomer. *British Journal of Applied Physics,* v. 8, Aug. 1957, p. 321-329.

Description and explanation of experiments on oxygen reaction with

barium to increase thickness of an oxide layer growing upon metal. Explanation is based on Mott's theory of oxidation of metals and the assumption that condensation of the first monolayer of oxygen can only start at and continue about nuclei in the surface of the metal film. 22 ref. (R2h; Ba, 14-12)

422-R. Corrosion Characteristics of Aluminum and Its Alloys. Pt. 2. R. F. Darnell. *Chemical Industry & Engineering,* v. 9, Aug. 1957, p. 19-23.

Effect of purity and alloying conditions on corrosion resistance; serviceability of aluminum under exposure to atmospheric attack, natural waters, sea waters, soil contamination, building materials, chemicals. 25 ref. (R general; Al)

423-R. Corrosion Resistance of Titanium. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 33. (CMA)

ICI is seeking a market for titanium on the basis of its corrosion resistance. The metal resists sea spray and immerson in sea water, even when fouling organisms grow on it. Titanium does not pit or etch in aerated sea water, nor do its fatigue properties diminish. Its nontoxicity in an environment of food products or body fluids is noted. Galvanic corrosion of titanium is not noticeable, but other metals coupled with titanium show varying amounts of corrosion.
(R general; Ti)

424-R. Chemical and Electrochemical Properties of $FeSn_2$. Roger A. Covert and Herbert H. Uhlig. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 537-542.

To determine corrosion properties of alloy layer existing between steel base and tin surface of tin plated steel, measurements of hydrogen overvoltage, corrosion potential and corrosion rates in two aqueous media were investigated. 13 ref.
(R11; *Sn,* ST, 8-12)

425-R. Corrosion Resistant Materials—Metals and Alloys. Lester F. Spencer. *Metal Finishing,* v. 55, Oct. 1957, p. 58-62.

Factors influencing the corrosion resistance of lead alloys, with special reference to the use of lead as a component of containers for oxide used in cleaning, anodizing, electroplating and pickling operations.
(R6, T29m, 17-7; Pb)

426-R. Scaling of Billets. J. Moreau and M. Cagnet. *Metal Treatment and Drop Forging,* v. 24, Sept. 1957, p. 362-366.

Results presented deal with total thickness, proportion of the different phases, porosity and adherence of the scale, together with the degree of atmospheric contamination and the decarburization of the underlying metal. (To be continued.)
(R2q; 4-2)

427-R. Testing and Examination of Electrodeposits. Pt. 3. Salt Spray Testing. R. Quarendon. *Product Finishing,* v. 10, Aug. 1957, p. 62-71.

Salt spray tests for evaluating corrosion resistance of plated metals. Importance of control of temperature, oxygen volume, movement of spray and shape of specimen. Techniques of salt spray testing and shortcomings. 36 ref. (R11j; 8-12)

428-R. Stress-Corrosion Cracking of Insulated Austenitic Stainless Steel. Arthur W. Dana, Jr. *ASTM Bulletin,* no. 225, Oct. 1957, p. 46-52.

The phenomenon of stress-corrosion cracking which may occur when austenitic stainless steels are exposed to moist thermal insulating materials is believed to result from the action of water-soluble chlorides leached from the insulations. Chemical analyses showed that water-soluble chlorides are present in 85% magnesia, calcium, silicate and glass fiber insulating materials, with little difference in chloride level between them. 7 ref. (R1d, R6; SS)

429-R. Platinum Takes Over. *Chemical and Engineering News,* v. 35, Oct. 28, 1957, p. 65, 108.

Platinum anodes for cathodic protection of ships. (R10d, 17-7; Pt)

430-R. Use of Stainless Steel to Combat Corrosion in the Chemical Industry. Pt. 1. Charles P. Dillon. *Corrosion,* v. 13, Sept. 1957, p. 124-138.

Nature of stainless and reason for corrosion resistance and passivity; relative value of quality control tests and metallographic examination in evaluation of stainless. Comparison of seamless and welded tubing; behavior of several stainless steels in acetic acid, sulphuric acid, caustic, sulphurous acid, phosphoric acid, nitric acid and cooling water environments.
(R6g, R4a, T29, 17-7; SS)

431-R. Resistance to Corrosion of Aluminum Alloys for Automotive Applications. E. T. Englehart, W. C. Cochran and E. P. White. *Corrosion,* v. 13, Sept. 1957, p. 555t-560t.

Atmospheric corrosion test data and field service results indicate that aluminum alloys are suitable for automotive trim.
(R3, T21c, 17-7; Al)

432-R. Corrosion and Metal Transport in Fused Sodium Hydroxide. Pt. 1. Experimental Procedures. G. Pedro Smith, M. E. Steidlitz and E. E. Hoffman. *Corrosion,* v. 13, Sept. 1957, p. 561t-564t.

Experimental techniques for studying corrosive reactions and metal transport in fused sodium hydroxide at temperatures up to 815° C.; methods include capsule test, cold finger and controlled atmosphere technique. 6 ref. (R6j; R11)

433-R. Aluminum Alloys for Handling High-Purity Water. W. W. Binger and C. M. Marstiller. *Corrosion,* v. 13, Sept. 1957, p. 591t-596t.

Data on water contamination in aluminum alloy storage tanks and piping, for handling distilled and demineralized water. 12 ref.
(R4a, T26q, 17-7; Al)

434-R. Formation of Oxide Films on Chromium and 18 Cr-8 Ni Steels. H. J. Yearian, W. D. Derbyshire and J. F. Radavich. *Corrosion,* v. 13, Sept. 1957, p. 597t-607t.

Formation of oxide film on simple chromium and 18-8 stainless steels oxidized in air at temperatures of 300 to 700° C. Film growth followed and components analyzed by electron microscopy and electron diffraction and X-ray diffraction methods. 24 ref.
(R1h, M21e, M22; SS)

435-R. Investigation of Inorganic Inhibitors for Minimizing Galvanic Corrosion of Magnesium Coupled to Aluminum. Sara J. Ketcham and Walter Beck. *Corrosion,* v. 13, Sept. 1957, p. 608t-614t.

Fundamental study of mechanism of protection afforded by inhibitors, magnesium vanadate, barium potassium chromate and calcium sulphide, in reducing galvanic corrosion between magnesium alloy AZ31B and aluminum alloy 2024-T3 in saline solutions. (R10b; Mg, Al)

436-R. NACE Technical Committee Report. Sect. 2. Bibliographies of Corrosion Products. Committee T-3B on Corrosion Products. *Corrosion,* v. 13, Sept. 1957, p. 565t-570t.

Selected abstracts on the identification and composition of corrosion products on aluminum, lead, silver, tin and magnesium alloys.
(R11, S10, S11; Al, Pb, Ag, Sn, Mg)

437-R. Symposium on Corrosion by High Purity Water. National Association of Corrosion Engineers. *Corrosion.* Committee T-3F on Corrosion by High Purity Water (Publication 57-22), v. 13, Sept. 1957, p. 571t-590t.

Papers abstracted separately.
(R4a)

438-R. Measurement of Corrosion Products in High Temperature, High Pressure Water Systems. A. A. Sugalski and S. L. Williams. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 572t-574t.

Highly efficient sintered nickel graphite imbedded filter used to remove corrosion products from hot water systems for analysis. Data on performance in removing iron, manganese, chromium and cobalt corrosion products.
(R4a, 2-12, R10a)

439-R. Corrosion of Aluminum-Nickel Type Alloys in High Temperature Aqueous Service. F. H. Krenz. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 575t-581t.

Tests to determine effect of alloy composition on corrosion resistance of aluminum alloys containing Ni, Cu, Fe and Si; corrosion rates of three alloys in static and flowing water at 250 to 300° C.; nature of attack. Effects on corrosion of reactor radiation in heat flux. 10 ref. (R4a, 2-12; Al, *Ni*)

440-R. Corrosion of Aluminum in High Purity Water. R. J. Lobsinger and J. M. Atwood. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 582t-584t.

In reactor, corrosion rate of 1245 and M-388 aluminum alloys determined in demineralized water at temperatures up to 200° C. Correlation between corrosion rate and effective aluminum surface temperature, effect of hydrogen ion concentration on corrosion rate. (R4a; Al)

441-R. Storage of High Purity Water. Richard R. Dlesk. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 585t-588t.

Protection of steel water tanks by coating with red lead paint, metallic zinc paint, synthetic rubber, nickel-phosphorus alloy, electroplated nickel or metallized aluminum; use of aluminum for water tanks; electrical resistance of film developed on 3003 aluminum alloy in tap, distilled and demineralized water.
(R4a, L general, T26q, 17-7; Al)

442-R. Water Conditions for High Pressure Boilers. D. E. Voyles and E. C. Fiss. Paper from "Symposium on Corrosion by High Purity Water." *Corrosion,* v. 13, 1957, p. 589t-590t.

Materials used in construction of boiler systems; operating conditions and data on water purity and corrosiveness. (R4a, T26q, 17-7)

443-R. Corrosion Research. Corrosion of Metals Group of the Chemical

Research Laboratory. Pt. 2. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 48-50.

Recent research on corrosion of gas service pipes, cathodic protection of copper in presence of hydrogen sulphide; atmospheric filiform corrosion of iron and aluminum; corrosion of electronic packaged goods by volatile contaminants; corrosion protection by lanolin films and vapor inhibitors; steel oxidation at high temperatures. (R general, A9h)

444-R. Cathodic Protection in Israel. Pt. 1. On the Land. D. Spector. *Corrosion Technology,* v. 4, Aug. 1957, p. 265-268.

Cathodic protection of steel pipe in irrigation networks in Israel. (To be continued.) (R10d, R8; ST)

445-R. Instruments for Cathodic Protection. *Corrosion Technology,* v. 4, Aug. 1957, p. 269-271.

Methods and instruments for measuring potential and resistivity of electrolyte in designing suitable cathodic protection. (R10d, X general, 1-2)

446-R. Zinc Anodes for Cathodic Protection. J. H. Morgan. *Corrosion Technology,* v. 4, Aug. 1957, p. 272-274.

Cathodic protection afforded by sacrificial zinc anodes for iron and steel structures, galvanized cold water storage tanks, aluminum and lead cables and marine installations such as ship hulls; zinc anode design. (R10d, 17-7; Zn)

447-R. Cathodic Protection of Steel Underground. *Corrosion Technology,*

Optimum protection potential for cathodic protection of steel in underground structures found to be −0.77 v. referred to a saturated calomel electrode. (R10d, R8; ST)

448-R. Protection of Steel Piles in Norway. *Corrosion Technology,* v. 4, Aug. 1957, p. 276-277.

Note on galvanic protection of steel piling. (R10d; ST)

449-R. U. S. Tankers Freed From Corrosion. John Grindrod. *Corrosion Technology,* v. 4, Aug. 1957, p. 278-280.

Hulls and ballast tanks of two chemical tankers protected by magnesium anodes. (R10d, T22g)

450-R. Protective Zinc Anodes. *Industrial Finishing,* v. 9, Sept. 1957, p. 814-816.

Explanation of the principles of cathodic protection, with emphasis on the use and advantages of high-purity zinc as anode material in soil and sea. (R10d, 17-7; Zn-a)

451-R. Mechanism of Formation of Metal Particles in Scale on Nickel Steels. K. Sachs. *Iron and Steel Institute, Journal,* v. 187, Oct. 1957, p. 93-104.

Metal particles form by the preferential oxidation of iron leading to the enrichment in nickel of metal entrapped in the advancing scale, and the transient solution of nickel in the wüstite followed by its precipitation on suitable nuclei. 10 ref. (R2q; AY, *Ni*)

452-R. Corrosion Properties of Zirconium and Zirconium Alloys. M. H. Boyer. *U. S. Atomic Energy Commission,* CRD-T2C-63, Oct. 23, 1951, 8 p. (CMA)

Resistance to a variety of agents. Zirconium dissolves completely in 98.9% NaOH. Proper welding techniques give corrosion resistant joints. (R general; Zr)

453-R. General Corrosion of WAPD Crystal Bar Zirconium. Pt. 1. Effect of Test Conditions. K. M. Goldman and D. E. Thomas. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-RM-116, Mar. 21, 1952, 13 p. (CMA)

Test conditions considered were distance and contact in degassed and aerated water, presence of nitrogen, effects of local boiling, convection currents and contamination by carbonyl iron, Na_2So_4 and NaF. A white corrosion product occurred only in the presence of nitrogen, except where zirconium was coupled to other zirconium specimens by stainless steel or zirconium bolts. The latter occurred most vividly in NaF solution. (R general; Zr)

454-R. Oxidation of Zirconium and Its Relationship to Corrosion in High Temperature Water. D. E. Thomas and J. Chirigos. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-98, Oct. 15, 1953, 21 p.

The kinetics of oxidation of zirconium in dry oxygen in the 300-787° C. range differed from oxidation in hot water. The mechanisms are basically alike but corrosion in water has an additional factor which does not become operative until the initial low rate is supplanted by a higher rate (at "breakaway"). 7 ref. (R1h, R4, 2-12; Zr)

455-R. High Temperature Oxidation of Zircaloy in Water. W. A. Bostrom. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-104, Mar. 19, 1954, 18 p. (CMA)

Oxidation rates for Zircaloy-2 and Zircaloy-3 submerged in water at 1300 and 1860° C. Extrapolating existing data for zirconium in air coincides with the observed rates. The reaction does not become autocatalytic even above the melting point. (R1h, R4, 2-12; Zr)

456-R. Preliminary Report on Corrosion of Uranium-Base Alloys Containing Niobium and Zirconium. A. E. Dwight and A. H. Roebuck. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5376, Dec. 19, 1954, 20 p. (CMA)

Composition and heat treatment versus corrosion resistance and hardness. Alloys were exposed to ungassed water at 400° F. Eleven compositions and eight heat treatments were covered. (R4a; U, *Cb, Zr*)

457-R. Oxidation of a Zirconium-50 w/o Uranium Alloy in Oxygen. L. D. Kirkbride and D. E. Thomas. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-LSR (MM)-43, Sept. 26, 1955, 10 p. (CMA)

The linear corrosion kinetics may be expressed by the equation $K = 1.26 \times 10^4 e - 16300/RT$ in both oxygen and water environments. The corrosion mechanism is therefore not dependent on hydrogen absorption. The corrosion product at 400° C. is tetragonal in both cases. (R1h; Zr, U)

458-R. An X-Ray Study of Zr-U_3Si Diffusion Zones. R. B. Roof, Jr. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-TN-532, Nov. 18, 1955, 9 p. (CMA)

The migration of the silicon out of U_3Si cores to form a corrodible silicide indicates that corrosion resistance may be improved by putting a barrier between the Zircaloy clad and the core. Barrier foils of Mo and Cb failed in two weeks or less at 650° F. in the same way as the clad cores. Aluminum looked more promising as a barrier material. 6 ref. (R general, N1; Zr, U, 8-16)

459-R. Effects of Electron Irradiation on the Corrosion of Zircaloy-2 in a Thermal Loop. B. O. Heston and M. D. Silverman. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-56-2-2, Feb. 2, 1956, 9 p. (CMA)

A few small crystals were evident on the surface of most irradiated specimens after 32 hr. Upstream and downstream areas had a golden glint and after 54 hr. showed red interference colors. White specks on the irradiated portion increased with irradiation and changed to buff or tan at the end of irradiation. (R general, 2-17; Zr)

460-R. Effect of Welding Atmosphere and Pickling on the Corrosion Resistance of Welded Zircaloy-2 and 3. K. H. Koopman, et al. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-1811. Aug. 8, 1957, 29 p. (CMA)

Autoclave tests on welded Zircaloy-2 and 3 in 680° F. water showed that the welding atmosphere affected corrosion resistance. With a helium-filled Plexiglas chamber, welds had a slight amount of white corrosion products. The effect of the gas shield was greater at higher rates of heat inputs. Zircaloy-3 welds were more susceptible to white corrosion than Zircaloy-2 welds. Corrosion increased with unpickled machined edges and entrapped acid in crevices. (R4; Zr, 7-1)

461-R. Research on the Influence of Ultrasonic Waves on Metallic Corrosion. A. Reggiori and T. Songa. Breda Instituto di Richerche Scientifiche Applicate, Milan, Italy. (Air Research and Development Command.) *U. S. Office of Technical Services,* PB 121964, Nov. 1956, 83 p.

Equipment and techniques for corrosion tests of stainless steel and Armco iron in four conditions—stagnant, with ultrasonic waves, with mechanical agitation, and with mechanical agitation and ultrasonic waves. The presence of ultrasonic waves in the electrolyte increases corrosion rate. Tests with gas-saturated solutions showed this action to be connected with the presence of oxygen in the attacking solution. A magnetostrictive ultrasonic wave generator was built. (R11a, 1-3, 1-24; SS, Fe)

462-R. Corrosive Effects of Protein-Type Foam-Forming Concentrates on Common Metals and Dissimilar Metal Couples. H. B. Peterson and J. C. Burnett. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131018, June 1957, 22 p. $.75.

Corrosion effects of four protein-type foam concentrate materials currently used for fire-fighting on common construction metals. Stainless 304 was most resistant, and brass, copper, steel and aluminum followed in that order. Aluminum was anodic to all metals except zinc and magnesium. Steady-state electrical current measurements were good indicators of relative intensity of corrosion. (R7p)

463-R. Corrosion of Metals in Tropical Environments. Pt. 1. Test Meth-

ods Used and Results Obtained for Pure Metals and a Structural Steel. A. L. Alexander, et al. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121952, June 1957, 46 p. $1.25.

Corrosion rates and characteristics of aluminum, lead, nickel, zinc, copper and structural steel exposed for eight years to five tropical environments in the Panama Canal Zone. (R3s, 1-4)

464-R. (German.) **Effect of Sulphur Content on Blast Furnace Slag and Its Corrosion Behavior.** Hans Ernst Schwiete, Ludwig Zagar, Peter Dickens and Paul König. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 187-194.

Corrosion tests for various conditions; surface treatment of fiber slag; effect of sulphide ion on corrosion of sheet iron.
(R general, 2-10; RM-q, *S*)

465-R. (German.) **Aerosol-Process Used in a New Corrosion Test Chamber.** W. Hess. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning,* v. 28, 1957, no. 1, p. 23-35.

Apparatus and procedures for aerosol fog corrosion testing; comparison with salt-spray tests. (R11k)

466-R. (Italian.) **Use of Aluminum in Contact With Other Metals.** A. Prati. *Ingegneria Meccanica,* v. 6, July 1957, p. 9-16.

Corrosion tendencies of more common assemblies of aluminum and other metal were evaluated and order of preference to be followed in selection of components of such bimetallic assemblies was established. 6 ref. (R1a; Al, 17-7)

467-R. (Italian.) **On the Causes of Internal Corrosion and Clogging in Water Mains.** R. Sandrinelli. *Ingegneria Sanitaria,* v. 5, Mar-Apr. 1957, p. 48-51.

Problem of corrosion of steel mains for portable water, with special reference to formation of nodular incrustations which, in addition to inducing corrosion, cause stoppage and reduction in carrying capacity; formation of heavy mineral incrustations not connected with corrosion but which contribute to obstruction of piping. (R4a, T26r; ST)

468-R. (Italian.) **Simplified Theory of Corrosion.** F. N. Speller. *Pitture-Vernici,* no. 5, May 1957, p. 335-339.

Explanation in simplified form of mechanism of corrosion as manifested in ferrous structures; directed to paint engineers. 4 ref. (R1, 10-1)

469-R. (Japanese.) **Utilization of Low-Grade Titanium Sponge Produced by the Kroll Process. Pt. 3. Corrosion of Ti-Fe Alloys in Hydrogen Sulphide Atmosphere at High Temperature.** Kazuo Hirayama, Nobuaki Gamo and Takeshi Takei. *Tokyo Scientific Research Institute, Reports,* v. 33, July 1957, p. 228-233. (CMA)

Corrosion resistance was not influenced by iron content, and was far superior to that of 18-8 stainless steel. Appreciable corrosive attack by hydrogen sulphide was observed at 600° C. and above. A relatively compact film of metallic sulphide was formed during the corrosion process, and the process was controlled by mutual diffusion of metallic and gaseous ions through the sulphide film. Corrosion rendered the alloys somewhat brittle, the degree of brittleness being proportional to the time and temperature. This embrittlement is attributed to the absorption of hydrogen. 7 ref. (R7k, 2-12; Ti)

470-R. (Croatian.) **Cathodic Protection of Iron. Pt. 3.** Tihomil Markovic. *Nafta,* v. 8, May 1957, p. 147-150.

Laboratory tests revealed that corrosiveness of soil can be reduced by saturating soil with water, which increases effectiveness of cathodic protection. (R10d, R8; Fe)

471-R. (Czech.) **Bleaching Clay as Cause of Corrosion.** Villiano Pallo and Joseph Prokes. *Electrotechnicky Obzor,* v. 46, no. 5, 1957, p. 245-247.

Sulphur in bentonite is liberated in course of refining process and causes severe corrosion of refining equipment and passes into the petroleum. Method for removing sulphur from bleaching clay. (R7k)

472-R. (German.) **Aqueous Corrosion Problems in Nuclear Reactors at High Temperatures.** Willibald Machu. *Atomkern Energie,* v. 2, July 1957, p. 248-255.

Aluminum, zirconium and beryllium as cladding materials for uranium and thorium; corrosion properties of materials used in construction of reactors such as stainless steel, chromium, nickel, cobalt, titanium, gold, platinum, silver, magnesium, copper, technetium. 29 ref. (R4a, W11p, 17-7)

473-R. (German.) **Corrosion Protection With Inhibitors.** H. Peukert. *Industrie-Anzeiger,* v. 79, July 19, 1957, p. 882-883.

Vapor phase inhibitors are good protectors against corrosion of steel and iron products, especially in shipping of finished products. (R10b; ST)

474-R. (German.) **Resistance of Copper Pipes to Sea Water.** K. Eichhorn. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 453-456.

Sea water pipes for ships consisting of Cu-Ni alloys (5% Ni) and of aluminum brass (2% Al) are more durable than those of copper alone. 6 ref. (R4b; Cu, *Ni, Al*)

475-R. (German.) **Stress-Corrosion of Wrought Alloys of Aluminum.** H. Vosskuhler. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 463-480.

Aluminum alloys show different durability depending on their respective electrochemical potentials. Stress-corrosion proceeds in two steps; First, long-term corrosive attack may occur at the grain boundaries; the second step occurs when the exposed surface of the potential accelerates the corrosive attack. 69 ref. (R1d; Al)

476-R. (German.) **Corrosiveness of Formaldehyde.** E. Lingnau. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 480-487.

The corrosive action of formaldehyde is due to the metal ions picked up from storage vessels (e.g., aluminum and steel). Storage vessels of the following materials do not contaminate formaldehyde—copper, nickel, tin, titanium, stoneware, porcelain, enamel, glass and concrete. 79 ref. (R7; Cu, Ni, Sn, Ti)

477-R. (German.) **Inhibition of Corrosion by Atmosphere Treatment.** A. Kutzelnigg. *Werkstoffe und Korrosion,* v. 8, Aug-Sept. 1957, p. 492-498.

Survey of corrosive air pollutants and traces, fog and condensed moisture. Air conditions in workshops; critical humidity, methods of dehumidification, mist dispersion, dust removal and detoxication; protection by use of kraft paper for packing purposes. 52 ref. (R3n, R10a, R10e)

478-R. (Italian.) **Adsorption and Incorporation of Sulphuric Acid Anions in Zirconium Oxide Films.** M. Maraghini and M. Serra. *Ricerca Scientifica,* v. 27, Aug. 1957, p. 2468-2474.

Passivity of zirconium surfaces obtained through oxidation (by air or anodic action) is destroyed by chlorine ions in the presence of SO_4 ions at a certain concentration ratio. By tagging SO_4 ions with radioactive S^{35} it was demonstrated that the destruction of the passivity coincides with a process of replacement of chlorine ions by SO_4 ions within the protective film. 12 ref. (R10c; Zr)

S Inspection and Control

506-S. Extraction and Flame Spectrophotometric Determination of Chromium. H. Alden Bryan and John A. Dean. *Analytical Chemistry,* v. 29, Sept. 1957, p. 1289-1292.

Extraction with 4-methyl-2-pentanone isolates chromium in the hexavalent state from all other elements except large amounts of iron. Iron however does not interfere with flame spectrophotometric determination. Accurate measurements can be made on as little as 0.1 gamma of chromium per ml. 13 ref. (S11a; Cr)

507-S. Separation and Determination of Tantalum. Glenn R. Waterbury and Clark E. Bricker. *Analytical Chemistry,* v. 29, Oct. 1957, p. 1474-1479.

A satisfactory procedure was developed for estimating 0.01 to 2% tantalum in uranium and plutonium alloys by combining separation of tantalum by extraction with colorimetric determination. 13 ref. (S11f, S11a; *Ta,* U, Pu)

508-S. Determination of Sulfur in Titanium. Maurice Codell, George Norwitz and Charles Clemency. *Analytical Chemistry,* v. 29, Oct. 1957, p. 1496-1499. (CMA)

Sulphur in titanium and titanium alloys can be determined by evolution of H_2S from the sample dissolved in a mixture of HCl and HF. H_2S is absorbed in a gas train in ammoniacal cadmium chloride solution carried in two tubes. After acidifying the tube absorbate on completion of the evolution, it is titrated against a standard KIO_3 solution. Selenium and arsenic interfere but are rare in titanium alloys. The method shows high accuracy and precision. 37 ref. (S11r; Ti, *S*)

509-S. Advances in Nondestructive Test Methods. *Metal Progress,* v. 72, Oct. 1957, p. 143-144, 222, 224.

Five individual tests are made on each tube accepted for a nuclear reactor—visual, fluorescent penetrant, X-ray, eddy current and ultrasonic. Latest devices in these fields are outlined, together with "Photostress", polarized light from a plastic sheet cemented to the part. (S13, 1-3)

510-S. Colorimetric Assay of Titanium in Beach Sands. J. A. Corbett and D. H. Parkhurst. *Mining Magazine,* v. 97, Sept. 1957, p. 185-186. (CMA)

A colorimetric method which can be used as a routine method for the estimation of titanium in beach sands and their ore dressing products. Other elements likely to be found in such deposits (e.g., iron, chromium, manganese, vanadium and columbium) do not interfere. Accuracy is within 0.3% for concentrates containing more than 95% TiO_2 and within 1% for tailings with 0.2% TiO_2. The method described uses a Hilger "Spekker" absorptiometer. 11 ref.
(S11a; Ti, RM-n)

511-S. Nondestructive Thickness Measurement of Anodizing Using the Interference Microscope. Roger L. Saur. *Plating*, v. 44, Oct. 1957, p. 1079-1082.

New method has been found for measuring film thickness. An interference microscope with two sources of light that can be used interchangeably, one white light, the other monochromatic, permits the thickness of anodized aluminum coatings in the range 0.00005 to 0.00008 in. to be determined quickly and without damage to the coatings. (S14d, 1-3; Al, 8-23)

512-S. Liquid Steel Temperature Measurement. A Review of the Quick-Immersion Thermocouple Method. W. C. Heselwood. *Platinum Metals Review*, v. 1, Oct. 1957, p. 110-118.

Types of thermocouples, composition, design, calibration maintenance and applications. 29 ref.
(S16j, 1-3; ST, 14-10)

513-S. Surface Finish. R. E. Reason and K. S. Collart. *Product Engineering*, v. 28, Sept. 16, 1957, p. 77-83.

Characteristics of surface irregularities produced in machining metal. Mechanical and electronic methods of recording surface irregularities as found by stylus pickups. Significance of tolerances and measuring techniques. (S15)

514-S. Statistical Study on the Homogeneity of Zinc-Base Spectrographic Standards. Robert C. Frank, James E. Dallemand and David L. Fry. *Spectrochimica Acta*, v. 9, no. 4, 1957, p. 323-331.

Large numbers of spectrographic determinations were made on six heats of zinc-base standards using a direct reading spectrograph and following predetermined pattern. Results were evaluated using a three-variable analysis of variance which indicated whether there was significant inhomogeneity of minor constituents of the alloys. When inhomogeneity was significant, Duncan test was used to find homogeneous regions in standard material which can be used satisfactorily. 6 ref. (S12j, S11k; Zn)

515-S. Sampling of Steel for Determination of Hydrogen Content. L. Bjerkerud. *Jernkontorets Annaler*, v. 141, no. 2, 1957, p. 94-99. (*Henry Brutcher Translation* no. 4028.)

Previously abstracted from original. See item 269-S, 1957.
(S12h; ST, H)

516-S. Determination of Tin in Zirconium and Its Alloys. D. F. Wood and R. T. Clark. *Analyst*, v. 82, Sept. 1957, p. 624-630. (CMA)

A volumetric method based on the reduction of tin with aluminum in the presence of $TiCl_3$ and oxidation of stannous ion with standard KIO_3. 5 ref. (S11j; Zr, *Sn*)

517-S. Gravimetric Determination of Barium in Zirconium Metal and in Certain Zirconium Salts. Louis Silverman and Katherine Trego. *Analytica Chimica Acta*, v. 17, Sept. 1957, p. 280-285. (CMA)

Separation is effected by a double precipitation in HCl followed by cupferron precipitation-chloroform extraction. Barium is then determined gravimetrically as barium sulphate. 10 ref. (S11b; Zr, *Ba*)

518-S. Evaporograph Measures Interior Wall Temperatures. *Blast Furnace and Steel Plant*, v. 45, Oct. 1957, p. 1140-1141.

New thermal-imaging camera which is accurate to 1° F. at distances over three miles registers temperature differences in target areas such as blast furnaces and openhearths and makes possible the detection of worn areas through heat of friction which registers on an oilcoated membrane enclosed in the device. (S16a, 1-2; D1, D2; ST)

519-S. A Trend in Steel Plant Temperature Measurements. Charles Maloney. *Blast Furnace and Steel Plant*, v. 45, Oct. 1957, p. 1156-1158.

Hard surface pyrometer for use on surface temperatures from 100 to 2400° F. Typical applications.
(S16n, 1-2; ST)

520-S. Spectrophotometric Determination of Titanium With Phenylfluorone. V. Damodaram. *Journal of Scientific and Industrial Research*, v. 16B, Aug. 1957, p. 366-369.

Determination of microgram quantities of titanium in alloys and in coatings on electrodes. The method is based on the formation of a pink complex between phenylfluorone and tetravalent titanium in acid solution. 17 ref. (S11a; Ti)

521-S. Five Minute Wet Analysis Speeds Steelmaking. Karl Jacobsen. *Modern Castings*, v. 32, Nov. 1957, p. 49.

Procedure illustrated and described. (S11; ST)

522-S. Ways to Control Temperatures Accurately and Economically. William C. West, Jr. *Precision Metal Molding*, v. 15, Nov. 1957, p. 79-80.

Brief introduction to the different types of instruments used in foundries. (S16, E general)

523-S. Polarographic Determination of Tin in Zirconium Alloys. J. T. Porter. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-M-JTP-1, May 25, 1956, 7 p. (CMA)

Fluoboric acid may be used as the solvent since it does not interfere, thus obviating the use of fuming H_2SO_4. Molybdenum does not interfere, nor does iron if reduced by iron powder prior to the polarographic analysis. (S11m; Zr, *Sn*)

524-S. Photometric Determination of Small Amounts of Aluminum in Steel Using 8-Hydroxyquinoline. T. S. Licht and A. J. Frank. Watertown Arsenal. *U. S. Office of Technical Services*, PB 131107, Nov. 1955, 18 p.

The method relies on a brief electrolysis at the mercury cathode which removes most of the iron and nearly all electro-reducible metals in the sample. Residual metallic interferences are complexed by the addition of tartrate and cyanide, and aluminum is extracted into chloroform as the 8-hydroxyquinolate. The aluminum content of the organic extract is determined spectrophotometrically at 390 millimicrons.
(511a; ST, *Al*)

525-S. Hydrogen Contamination in Titanium and Titanium Alloys. Pt. 2. Comparison of Various Methods for Hydrogen Analysis. J. W. Seeger and J. A. Winstead, Wright Air Development Center, Technical Report 54-616, *U. S. Office of Technical Services*, PB 121761, Oct. 1956, 94 p.

Cost data. Handling problems of analytical disagreement between laboratories. (S11r; Ti, *H*)

526-S. Spectrographic Analysis of Solid Titanium. J. A. Winstead. Wright Air Development Center, Technical Report 56-600, *U. S. Office of Technical Services*, PB 121185, May 1957, 27 p. (CMA)

Excitation conditions were established for the spectrographic analysis of solid titanium. Analytical results for a number of specimens.
(S11k; Ti)

527-S. Studies of Quantitative Methods for the Separation and Determination of Zirconium and Thorium in Magnesium Alloys. B. A. Raby. Wright Air Development Center, *U. S. Office of Technical Services*, PB 131244, June 1957, 61 p. $1.75.

Comparative study of analytical methods for the determination of thorium and zirconium and feasibility of separating these two elements by an ion exchange.
(S11f; *Zr, Th*, Mg)

528-S. (Czech.) Rapid Methods of Analysis of Metals and Mineral Raw Materials. Pt. 3. Polarographic Determination of Vanadium in Mineral Raw Materials. Z. Sulcek. *Chemické Listy*, v. 51, Aug. 1957, p. 1453-1456. (CMA)

The sample is calcined with sodium carbonate, whereby vanadium becomes isolated from interfering elements. It is then determined in the presence of potassium cyanide as a compound with complexone III. 16 ref. (S11m; V)

529-S. (French.) Precise Determination of Carbon Content by a Conductivity Recorder. Walter Koch and Hans Malissa. *Métallurgie et al Construction Mécanique*, v. 89, Sept. 1957, p. 719-727.

Process is based on the variations in the conductivity of a soda lye when gases containing carbonic acid pass through it. The difference between the conductivity of a measured path and that of a reference path is measured. Determination of carbon content of various structural compounds. Description of apparatus, calibration, control of combustion. (S11; ST, *C*)

530-S. (German.) A Simple Method for the Separation of Titanium, Columbium and Tantalum From Hard Metals. E. Lassner and H. Weisser. *Zeitschrift für Analytische Chemie*, v. 157, no. 5, 1957, p. 343-345. (CMA)

A simple and rapid method by precipitation with ammonia in the presence of EDTA. The relative error of the determination is not greater than ± 1%. The method is particularly suitable for operational conditions. 4 ref. (S11f; Ti, Cb, Ta)

531-S. (German.) Chemical Preparations for Spectrochemical and Photometric Trace Determination in Metals and Ores. Hermann Specker and Heinrich Hartkamp. *Zeitschrift für Erzbergbau und Metall-Hüttenwesen*, v. 10, Mar. 1957, p. 117-122.

Interference level and limits of detection; basic premises for concentration and concentration methods; extractive concentration. 27 ref.
(S11a)

532-S. (Italian.) **Determination of Tin and Antimony in Type Metal and Antifriction Alloys.** Vincenzo Tamburrini. *Chimica e l'Industria,* v. 38, Mar. 1956, p. 183-185.

(S11; SGA-c, SGA-d, *Sn, Sb*)

533-S. (Italian.) **Quantitative Chromatographic Analysis of Cobalt in Zinc Electrolytes.** Eugenio Bertorelle and Ernestina Paglia. *Chimica e l'Industria,* v. 38, May 1956, p. 384-385.

Method based on co-precipitation of cobalt with manganese by means of sodium dithionite in ammoniacal medium and in presence of ammonium chloride. 5 ref. (S11a; Zn, *Co*)

534-S. (Japanese.) **Spectrographic Determination of Iron and Magnesium in Titanium Metal.** Yosichika Oto and Chujo Matsumoto. *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, June 1957, p. 689-691. (CMA)

Quantitative spectrographic analysis of iron and magnesium in titanium was carried out using porous cup electrodes in which the solution of each sample to be analyzed was poured. By means of the spectrographic colorimetry method, iron and magnesium were determined quantitatively in the ranges 0.01-0.5% and 0.01-0.7%, respectively. 3 ref. (S11k; Ti, *Fe, Mg*)

535-S. (Japanese.) **Determination of Oxygen in Titanium by Micro Bromination Methods.** Makoto Kawane and Mitsunao Takahashi. *Journal of Japanese Chemistry,* v. 11, Mar. 1957, p. 201-208. (CMA)

Comparison of the microbromination and vacuum fusion methods for determining oxygen in titanium. Advantages of the former include easier operation, accuracy, and time required for the analysis. Another advantage lies in the ability to analyze oxygen in titanium alloys which contain volatile additives such as manganese and magnesium. This is not possible with the vacuum fusion method. 23 ref. (S11r; Ti, *O*)

536-S. (Russian.) **Phosphate-Oxyquinoline Method of Separating and Volumetric Determination of Zirconium.** A. V. Vinogradov and V. S. Shpinel. *Atomnaya Energiya,* v. 3, Aug. 1957, p. 130-140. (CMA)

Combination of the known method of clean separation of zirconium from accompanying elements (except hafnium) by means of phosphate precipitation with the seldom used determination of zirconium as an oxyquinolate titrated with potassium bromate. Zirconium amounts of 2-5 mg. are determined with an accuracy up to ± 2-4%. 18 ref. (S11j; Zr)

537-S. (Russian.) **Determination of Arsenic in High-Purity Lead by Means of Complexone.** Yu. Yu. Lurie and A. N. Minenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 785-786.

A method of quantitative determination of arsenic, present in small quantities (0.1 mg.) using Complexone-III-ethylene diamine sodium tetracetate and subsequent coprecipitation with iron hydroxide. (S11j; Pb-a, *As*)

538-S. (Russian.) **Photocolorimetric Determination of Small Quantities of Copper, Using 2, 2′ Diquinolyl.** A. L. Gershuns and Yu. V. Bashkevich. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 787-788.

Few thousandths of a percent of copper can be determined, using 0.02% solution of diquinolyl in isoamyl alcohol. A detailed method is given. (S11a; Cu)

539-S. (Russian.) **Polarographic Determination of Manganese in Copper Alloys by Oxidation on Platinum Anode.** E. M. Skobets and N. I. Belinskaya. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 791-793.

Method of quantitative, polarographic determination of manganese in copper alloys, using ammoniacal solution. (S11m; Cu, *Mn*)

540-S. (Russian.) **Trilonometric Determination of Magnesium in Aluminum Alloys.** L. M. Budanova and R. S. Volodarskaya. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 797.

Method of magnesium titration with Trilon B. When magnesium content is not less than 0.5%, nickel is absent and manganese contents less than 0.5%, buffer solutions can be used in place of sodium diethyl dicarbamate for masking undesirable elements on titration. (S11j; Al, *Mg*)

541-S. (Russian.) **Color Method of Defectoscopy.** N. V. Khimchenko. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 803-806.

A method for detecting minute imperfections on metal surfaces with the naked eye. (S13d, 9-21)

542-S. (Russian.) **Perfection of Color Defectoscopy.** S. I. Kalashnikov and N. P. Kichin. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 806-808.

Composition of a red stain and a white lacquer making feasible detection of extremely fine surface cracks and intercrystal corrosion. (S13a; 9-21)

543-S. (Russian.) **Induction Method of Annealed Layer Thickness Measurement.** M. A. Kotis. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 819-821.

Magnetic method of measurement of thickness of annealed steel layer. Results are compared with values obtained by metallographic measurements. (S14h; ST)

544-S. (Russian.) **Device for Ultrasonic Defectoscopy of Welded Seams.** A. K. Gurvich. *Zavodskaia Laboratoria,* v. 23, July 1957, p. 858-860.

A method of welded seam checking using standard ultrasonic defectoscopes. 6 ref. (S13g; 7-1)

545-S. (English.) **Photometric Determination of Tin in Iron and Steel. Pt. 3. Photometric Determination of Tin With Sodium Diethyldithiocarbamate.** Hidehiro Goto and Yachiyo Kakita. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 9, Aug. 1957, p. 253-261.

Tin was separated from iron by coprecipitation with manganese dioxide, then the photometric determination was made after extracting tin as its diethyldithiocarbamate complex with an organic solvent. 6 ref. (S11a; Fe, ST, *Sn*)

546-S. (German.) **Simple Method for Separation of Titanium, Columbium and Tantalum in Hard Metals.** E. Lassner. *Planseeberichte für Pulvermetallurgie,* v. 5, Aug. 1957, p. 53. (CMA)

Method consists of an ammonia precipitation in the presence of glycerin and complexone. It is rapid, accurate to within ±1% and particularly suitable for operational conditions. (S11j; Ti, Cb, Ta)

547-S. (Japanese.) **Studies on Simultaneous Quantitative Analysis of Carbon and Hydrogen in Titanium.** Nakaaki Oda and Katsusuke Norishima. *Electrochemical Society of Japan, Journal,* v. 25, July 1957, p. 365-368. (CMA)

Apparatus used. The chlorine in the system interferes with the combustion method used and is removed by means of granulated silver or silver net heated to 400° C. The collection ratio of the chlorine using different forms of silver is compared. 10 ref. (S11r, 1-3; Ti, *C, H*)

548-S. (Japanese.) **Determination of Carbon in Titanium by Microcombustion Method.** Makoto Kawane and Mitsunao Takahashi. *Journal of Japanese Chemistry,* v. 11, June 1957, p. 437-440. (CMA)

The organic microanalysis method for the determination of carbon in metallic titanium. When compared with the macrocombustion analysis method, the new method was found to be simpler in operation and not at all inferior in accuracy. 16 ref. (S11s; Ti, *C*)

549-S. (Book.) **Radiography in Modern Industry.** 2nd Ed. 136 p. 1957. Eastman Kodak Co., X-Ray Div., 343 State St., Rochester 4, N. Y. $5.

Reference manual for the professional and text for the student; X-ray and gamma-ray sources, screens, films, processing and protection. (S13e, X8g, 1-2)

T Metal Products and Parts

306-T. Bearings, Lubricants, and Lubrication. A Digest of 1956 Literature. *Mechanical Engineering,* v. 79, Sept. 1957, p. 842-852.

Literature review reports investigations of theoretical and practical nature on design, lubrication, bearing materials and lubricants. Studies of boundary lubrication and lubrication in relation to metal forming and metal cutting; reviews automotive lubricants and properties of lubricants. 163 ref. (T7d; NM-h, 18-23)

307-T. Molybdenum for Aircraft Applications. *Metal Industry,* v. 91, Sept. 6, 1957, p. 193-195.

Comparison of the 100-hr. stress-rupture properties of two molybdenum-base alloys and several of the best conventional nickel and cobalt-base superalloys. Oxidation resistance and high-temperature properties are evaluated. 5 ref. (T24, 17-7, Q3m; Mo)

308-T. Tips on Design and Application of Alloy Heating Elements for Optimum Service. *Industrial Heating,* v. 24, Oct. 1957, p. 2058-2062.

Application of resistance alloys in appliances and industrial heating equipment. (T1p, T10c, 17-7; SGA-q)

309-T. Aluminium for Heating in Tankers. H. M. Walter. *Metal Industry,* v. 91, Sept. 27, 1957, p. 279-282.

Heating coils in a tanker to maintain oil at the necessary fluidity have to withstand heavy chemical and electrochemical influences from sea water and oil. Aluminum tube "Alacoil" has good ductility and robustness, efficient heat transfer, low weight, economy and corrosion resistance. 22 ref. (T22m, 17-7, R7; Al)

310-T. Atomic Fuels. Frank H. Spedding. *Metal Progress,* v. 72, Oct. 1957, p. 105-111.

Several fissionable isotopes will be available to fuel the future power reactors, and could be used as solid metal or alloys, as a molten mixture or in liquid solution. Various coolants and moderators are also possible. To determine which combination of these can best produce economical electricity is the aim of the Atomic Energy Commission's extensive and costly developmental program. It will require years of hard work by metallurgists and other engineers.
(T11g, W11p; U, Th, 14-13)

311-T. Testing of Welded Aluminum Hopper Cars. J. F. Whiting. *Metal Progress,* v. 72, Oct. 1957, p. 125-128.

About 150 aluminum freight cars of three designs have been made by Canadian car builders. To devise improvements strain gages were placed at strategic positions on full-sized hopper cars. These are of welded construction using strong aluminum alloys, sheet and extrusions, even to the center sill. Stresses were measured during static, shake-out and impact tests simulating actual service conditions.
(T23p, 17-7, S21; Al, 17-1)

312-T. Tubes for Atoms. J. S. Rodgers. *Modern Metals,* v. 13, Sept. 1957, p. 82, 84, 86. (CMA)

Development work on the extrusion properties, cold working with ordinary equipment, and annealing, cleaning and finishing of Zircaloy tubes. (T11g, 17-7, F24, Zr, 4-10)

313-T. Corrosion and Food Manufacture. J. W. Selby. *Corrosion Prevention and Control,* v. 4, Sept. 1957, p. 37-40, 46.

Use of stainless steel, aluminum and copper and tinplate materials in the food industry.
(T29p, 17-7; SS, Al, Cu, Sn)

314-T. The Hot Airplane. H. B. Sipple and G. G. Wald. *Mechanical Engineering,* v. 79, Oct. 1957, p. 925-927.

Interrelated problems of weight, heat resistant metals, size, close tolerances and dimensional precision for high-performance supersonic aircraft. Development of essential new materials, fabrication methods and processing procedures to offset construction problems and reduce production costs seen dependent upon continued support of government-sponsored research and ingenuity of free enterprise in industry. (T24, 17-7)

315-T. Light Alloys in Shipbuilding. *Metal Industry,* v. 91, Oct. 18, 1957, p. 337-339.

Choice of alloys, fabrication, corrosion resistance, bimetallic corrosion and welding of aluminum superstructures; paper given at Autumn meeting of the Institute of Metals in Glasgow, Scotland. (To be continued.) (T22j, 17-7; Al)

316-T. Double-Duty Dyna. Kim Darby. *Modern Metals,* v. 13, Sept. 1957, p. 37-38.

All-aluminum welded yacht.
(T22g, 17-7, K general, Al)

317-T. All-Welded Aircraft Engine Skid. R. E. Aker. *Modern Metals,* v. 13, Sept. 1957, p. 70-72.

Skid fabricated by metal inert-gas welding from 6061-T6 aluminum alloy. (T24d, 17-7, K1d; Al)

318-T. Aluminum in Mobile Homes. E. A. Farrell. *Modern Metals,* v. 13, Sept. 1957, p. 92-114.

Utilization of aluminum in house trailers estimated to average 350 to 400 lb. each and add to an annual total of 30 to 50 million lb.
(T26n, 17-7; Al)

319-T. Steel Castings in Air Frames. S. K. Hodgson. *Precision Metal Molding,* v. 15, Oct. 1957, p. 37-38.

Use of steel investment castings at Chance Vought Aircraft. Most of the castings are 410 stainless steel at 180,000 psi. min. tensile strength. (T24a, 17-7; SS, 5-12)

320-T. HRT Design Request No. 2 Titanium Components for Alternate Blanket System. R. B. Briggs, J. W. Hill and J. R. McWherter. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* CF-54-4-105, Apr. 15, 1954, 11 p. (CMA)

The HRT is a nuclear reactor with heavy water solution core surrounded by a reflector or blanket. Feasibility of titanium components. Titanium has excellent resistance to corrosive attack by uranyly sulphate in the range 250-275° C. while stainless is suitable only below 125° C. 9 ref. (T11k, 17-7; Ti)

321-T. Fabrication of Clad Uranium-Molybdenum Fuel Bearing Rods for Metallurgy Experiments. J. H. Alapatz. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-71, Apr. 29, 1954, 13 p. (CMA)

Experimental fabrication of Zircaloy-2 clad U-Mo fuel cores. Extrusion to the final rod is not recommended. Drawing the extruded composite gives more accurate dimensioning to the final rod. Swaging causes a harmful broadening of the fuel-clad interface.
(T11g, 17-7, F27; U, Zr, 8-16)

322-T. Pressure Bonding of Natural Uranium in Zircaloy-2 Hemispherical Cups. B. E. Schame. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-77, May 8, 1954, 9 p. (CMA)

Uranium-filled pellets can be produced by pressure bonding uranium cores to prefabricated Zircaloy-2 shells. The maximum amount to which the Zircaloy-2 hemisphere could be filled was only about 70%.
(T11g, K13, 17-7; U, Zr)

323-T. (English, German, French, Spanish.) **Special Steels Used in Machinery for the Iron Mines.** *Aciers Fins & Speciaux Francais,* no. 26, July 1957, p. 36-42.

Chemical compositions and mechanical properties of special steels used in drilling machines, scraper loaders and continuous loaders, shuttle cars and underground locomotives. (T28, 17-7; ST)

324-T. (French.) **Use of Standardized Elements in the Manufacture of Cutting and Punching Tools.** *Machine Moderne,* v. 51, Sept. 1957, p. 1-2.
(T6n, 1)

325-T. (Italian.) **Nickel Catalysts in Hydrocarbon-Steam Reactions.** *Nickel,* no. 69, Aug. 1957, p. 8-14.

Superiority of nickel over other metals in promoting re-forming reactions, especially when nickel is used in conjunction with refractory base; characteristics of refractory bases; effects of composition of refractory, nickel content and temperature on activity of nickel catalysts. (T29, 17-7; Ni, NM-c)

326-T. (Pamphlet.) **Railways and Steel.** 65 p. Steel, Engineering and Housing Section of the Secretariat of the U.N. Economic Commission for Europe. International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y. $.60.

Evolution of production and requirements of steel for European railways; consequences on steel requirements of such developments as electrification, greater traffic speed, shorter turn-round time. Development of railways and the evolution of production of railway materials outside Europe; future export prospects for rails and rolling stock.
(T23, 17-7, A4; ST)

W Plant Equipment

438-W. Russian Basic Roof Experience. *Iron & Steel,* v. 30, Sept. 1957, p. 429-434.

Based on experiences of various plants forming the Inter-Works School, recommendations are given for furnace design, thermal conditions and maintenance.
(W18r, 1-2; ST, RM-h)

439-W. Induction Heating for Merchant Mill. R. S. Segsworth. *Metal Progress,* v. 72, Oct. 1957, p. 129-132.

Billet-sized ingots are pushed end to end through a long induction coil, the first half of which receives 60-cycle current and the second half 540-cycle current. A 6½-in. square reaches rolling temperature in 8.4 min. Indicated scale loss of 3% in oil-fired heaters has been reduced to less than 1%.
(W20h; 1-19; CN)

440-W. The Phoenix Hydro-Cyclone. Philip Rabone. *South African Institute of Mining and Metallurgy, Journal,* v. 52, July 1957, p. 724-732.

Development of low-velocity open-top cyclone with adjustable vortex pipe and flexible rubber inlet and underflow-discharge nozzles. Models with both conical and cylindrical skirts are in successful operation. Overflow product can be varied while cyclone is in operation. Ease of adjustment, low wear and freedom from choking are claimed. A simple adaptation of vortex pipe has enabled cyclone to be used for thickening. (W15, 1-2; Au)

441-W. Al Alloy Variety Spurs Use in Exchangers. R. W. Flournoy. *Chemical Engineering,* v. 64, Oct. 1957, p. 318-324.

Multiplicity of aluminum alloys, including new high-strength alloys, gives wide choice of properties, equipment designs, for process heat exchangers. 7 ref. (W13b, 17-7; Al)

442-W. Continuous High Speed Heating and Rolling of Copper Cakes. E. W. Weaver. *Industrial Heating,* v. 24, Oct. 1957, p. 1996-2004.

An automatically operated pusher-type high-speed cake heating furnace, utilizing controlled atmosphere. (W20h, F23, 1-2, 1-11; Cu)

443-W. Alloy Fans in Heat Treating Furnaces Have Long Service Life at 1600-1800° F. *Industrial Heating,* v. 24, Oct. 1957, p. 2066-2068.
(W27p, 17-7; SGA-h)

444-W. Infrared Oven Used for Dynamic Etching Process. William L. Timm. *Industrial Heating,* v. 24, Oct. 1957, p. 2104-2108.

Oven provides a semi-mild cure to masking prior to etching process.
(W4k, 1-2)

445-W. How to Select a Vacuum Arc Furnace. L. L. Johnson. *Iron Age,* v. 180, Oct. 3, 1957, p. 96-99.
Criteria for furnace selection.
(W18, W27, 1-23, 1-2)

446-W. Algoma's Combination Bar and Strip Mill. W. H. Mulflur. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 73-82.
A 30-in. combination mill uses interchangeable stands on the same mill shoes and on the same pass line allowing for great flexibility.
(W23c, W23d, 1-2; ST)

447-W. New Merchant and Bar Mill Has Improved Lubrication System. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 137-138.
Three special-built mill lubrication systems feed approximately 475 gpm. of extreme pressure oil of various viscosities to gears and bearings on drives at Atlantic Steel Co.
(W23m, 1-2, 18-23; ST)

448-W. Multiple Strip Processing Gains in Popularity. E. F. Boening. *Iron and Steel Engineer,* v. 34, Oct. 1957, p. 146.
Two-strand anneal and pickle line is being erected in an eastern steel mill by Allis-Chalmers Manufacturing Co. (W23c; ST)

449-W. Aluminium Foil Production. *Metal Industry,* v. 91, Oct. 4, 1957, p. 296-297.
Four new mills at Venesta Ltd., Silvertown, England, weigh 60 tons each and their combined output is about 3500 lb. of foil per hr.
(W23, 1-2; Al, 4-6)

450-W. Three Steps to Profitable Use of Molding Machines. J. M. Leaman and D. C. Ekey. *Modern Castings,* v. 32, Nov. 1957, p. 41-48.
Functions, mechanical actions, relation to foundry layout and selection of molding machines.
(W19h, 1-2)

451-W. Best Automatic D-C Source? J. H. Headapohl, Robert A. Wilson and George G. Glenn. *Welding Engineer,* v. 42, Oct. 1957, p. 34-38.
Opinions on advantages and limitations of constant voltage power, variable voltage or constant voltage rectifier as power sources for automatic arc welding. (W29a, K1, 1-2)

452-W. Electrical Requirements for Automation in Arc Welding. R. W. Tuthill and R. D. Mann. *Welding Journal,* v. 36, Oct. 1957, p. 980-985.
Low voltage power supplies and high current density make it possible to use simplified wire-feeding systems. (W29b, K1, 1-2)

453-W. (French.) Contribution to the Study of Rolling Mill Equipment. Pt. 2. Equipment for Rolling Semi-Finished Products. G. Grenier. *Echo des Mines et de la Metallurgie,* v. 3507, Aug. 1957, p. 461-464.
Description of blooming mills at Gary Works of Indiana Steel, Jones & Laughlin Aliquippa Works, American Rolling Mill Middletown Works, U. S. Steel Templeborough Works (England), Bethlehem Steel Sparrows Point Works. (To be continued.) (W23a, 1-2)

454-W. (French.) No. 2 Blast Furnace at Société Métallurgique de Knutange. Max Brun. *Technique Moderne,* v. 49, July 1957, p. 330-331.
Description of furnace lighted in 1953, in trouble-free operation since, averaging 14,000 tons per month production. (W17g, 1-2)

455-W. (French.) Control and Regulation of Fuel Oil Fired Martin Furnaces. F. Bourdillon. *Technique Moderne,* v. 49, July 1957, p. 338-340.
Examination of particular case involving tilting furnace with basic vault, pouring 160 tons of steel per melt; fuel is No. 2 heavy oil attaining temperature of 100-120° C. in burner; fuel sprayed by compressed air or steam at 10 kg. per sq. cm.; control and regulation of fluid deliveries, pressures and combustion, and pyrometric controls.
(W18r, S18, S16)

456-W. (French.) Arc Melting Furnaces for Steel. R. Boutigny and C. Barbaanges. *Technique Moderne,* v. 49, July 1957, p. 341-348.
Development of arc furnaces and use in various countries; characteristics; manufacture of steel in arc furnaces and new techniques (use of oxygen, temperature and analysis control, electromagnetic stirring, gas removal) available to steelmakers; Martin furnace and electric furnace cost comparison. 6 ref.
(W18s, D5, 1-2; ST)

457-W. (French.) Continuous Wire Mill at Wendell Plant in Joeuf. J. Boulange and M. Biau. *Technique Moderne,* v. 49, July 1957, p. 351-353.
Brief comparison of new and old type wiredrawing equipment. Description of mill at Wendell plant, including electrical equipment and coiler controls. (W24k, 1-2)

458-W. (French.) Société Métallurgique de Normandy's Continuous Wire Mill. L. Boulez. *Technique Moderne,* v. 49, July 1957, p. 354-357.
General description of equipment put into service in 1951, now producing some 200,000 tons of wire per year, 75 to 80% of which is in small sizes. (W24k, 1-2)

459-W. (French.) Iron Mill of Sidélor Works at Homécourt. M. Simon. *Technique Moderne,* v. 49, July 1957, p. 358-360.
Entirely mechanized, continuous 7-stand blooming mill, 6-stand zigzag finishing mill, coilers, cooler, storing area, loading equipment. Rolls bars and rounds; tooling for angle-iron in preparation.
(W23, 1-2; ST)

460-W. (French.) Reheating of Ingots in Soaking Pits. *Technique Moderne,* v. 49, July 1957, p. 366-369.
Types of soaking pits; maintenance of covers; heat recuperators; control and regulation; refractories and maintenance; reheating time and calory consumption; electric soaking pits. (W20g, 1-2)

461-W. (French.) Role of Mechanization in the 720 Sheet Rolling Mill. G. Liégeois. *Technique Moderne,* v. 49, p. 370-374.
Mechanized aspects of conveyers, roll stands, speed controls of continuous mill at Rehon plant in Provence, in operation since 1951. hot rolling all types of steel strip from 100 to 600 mm. wide by 1.25 to 7 mm. thick. (W23c, 1-2, 18-24)

462-W. (French.) Usinor's Montataire Works: Continuous Pickling Line, New Four-Stand Rolling Mill, Annealing, Skin Pass. M. Mallet. *Technique Moderne,* v. 49, July 1957, p. 375-381.
In 1950 Usinor installed first continuous cold rolling mill for thin strip in France. Description and operating details. (W23f, 1-2)

463-W. (French.) Sendzimer Cold Rolling Mill in Isberques Works of Compagnie des Forges de Chatillon: Electrical Equipment. J. L. Ceyrac. *Technique Moderne,* v. 49, July 1957, p. 383-390.
Description of electrical equipment and its role in simplifying regulation of rolling operations.
(W23f, W23n, 1-2)

464-W. (French.) Mechanized Mills for Rolling Thin Sheet. V. Charet. *Technique Moderne,* v. 49, July 1957, p. 393-394.
Hot rolling of 2.5 to 0.4-mm. sheet from billets. Roughing and finishing stands, pre-heating furnaces.
(W23c, 1-2)

465-W. (French.) S.A.F.E.'s Reversible Quarto Train, Annealing and Duo Skin Pass. M. Jobard. *Technique Moderne,* v. 49, July 1957, p. 396-398.
Cold rolling of thin sheet at S.A.F.E. plant in Hagondange. Equipment and operating details.
(W23c, 1-2)

466-W. (French.) New Rolling Mill at Longwy Works of Société Lorraine-Escaut. J. Friry. *Technique Moderne,* v. 49, July 1957, p. 402-406.
General layout; electrical equipment and pit furnaces. (W23, 1-2)

467-W. (French.) Annealing Furnaces for Steel. *Technique Moderne,* v. 49, July 1957, p. 416-418.
Description of removable hearth or removable hearth and top furnaces, bell furnaces, continuous furnaces, roller furnaces; applications of each type. (W27, J23, 1-2; ST)

468-W. (French.) Auxiliary Equipment for Steel Furnaces. R. Petitjean. *Technique Moderne,* v. 49, July 1957, p. 425-430.
Equipment for raw material preparation and transport to furnace; for charging and tapping; for handling pouring ladles and assuring evacuation of processed materials.
(W12, W18, 1-2; ST)

469-W. (French.) Finishing Equipment Used in the Rolling of Steel. E. Goue. *Technique Moderne,* v. 49, July 1957, p. 431-433.
Equipment for finish rolling of shapes, rounds and flat products.
(W23q, 1-2; ST)

470-W. (French.) Recent Improvements in Equipment for Rolling Heavy Plate. J. Charles. *Technique Moderne,* v. 49, July 1957, p. 434-436.
New equipment developed by Societe Moeller et Neumann: hot straightener, roller-type cooler with turn-over device to permit surface inspection, shearing line. (W23b, 1-2)

471-W. (German.) Choice of Steels for Pressure Casting Dies. Herbert Briefs. *Giesserei,* v. 44, Sept. 26, 1957, p. 588-593.
Grouping of the hardenable hot working steels according to alloy content and performance; development and present state of the die steels used; comparison between the air hardening chromium-molybdenum steels and the 5% tungsten steel in behavior in tempering in the tensile test at elevated temperatures and in elongation; possibilities of increasing the efficiency of dies made of conventional steels. 8 ref.
(W19n, 17-7; TS-k)

472-W. (Italian.) Induction Forehearth and the Induction Mixer in the Modernization of Cast Iron Foundries. A. Tagliaferri. *Fonderia,* v. 6, Aug. 1957, p. 337-340.
Low-frequency induction equipment. Ease and economy of operation, excellent metallurgical control afforded. Installations in Italy, France, Mexico, and Spain.
(W18a, 1-2; CI)

473-W. (Russian.) Configuration of Ingot Bottoms. L. B. Andreyuk. *Stal',* v. 17, Jan. 1957, p. 35-38.
Cropping scrap was reduced by the addition of a bottom plate with spherical holes and by changing the shape of the mold bottom.
(W19c, 1-2; ST)

474-W. (Russian.) **Use and Repair of 200-Ton Ladles.** V. I. Morozov and M. T. Burnaev. *Stal',* v. 17, Jan. 1957, p. 38-42.

The capacity of ladles was increased by appropriate design to enable them to handle the growing production of openhearth furnaces. Their utilization was improved by mechanization of maintenance and repair. (W19b, 1-2; ST)

475-W. (Russian.) **Increasing the Productivity of No. 2 Blooming Mill.** V. P. Kozhevnikov, A. M. Uzienko, G. G. Kustobaev, G. V. Saveliev and F. P. Skachko. *Stal',* vol. 17, Jan. 1957, p. 47-52.

Production of blooming mill was increased 86.5% while scrap was reduced from 0.32 to 0.13% by reconstruction and by introduction of automation. (W23a, 1-2, 18-24; ST)

476-W. (Russian.) **Results of Modernizing No. 3 Blooming Mill in Magnitogorsk.** L. V. Andreyuk. *Stal',* v. 17, Jan. 1957, p. 53-59.

By adding a reversing stand, lengthening the receiving table and increasing the speed of the ingot buggy, production was increased 8.5—47.0% according to the shape rolled. The extent of modernization was limited mainly by available heating capacity. (W23a, 1-2; ST)

477-W. (Russian.) **Durability of Steel Ingot Molds.** C. M. Bobrovskikh and A. G. Nikolaev. *Stal',* v. 17, Jan. 1957, p. 84-88.

The life of ingot molds may be considerably increased by proper chemical composition, correct design, effect of cooling, their position on the ingot cars and control of pouring. (W19c, 17-7, 1-2; ST)

478-W. (Russian.) **Tasks of Machine Building Industry in Developing Equipment for Openhearths.** V. A. Brandt. *Stal',* v. 17, Feb. 1957, p. 119-124.

Requirements for the sixth five-year plan. Complete mechanization is urged with utilization of most up-to-date heavy duty equipment. 4 ref. (W18r, 1-2)

479-W. (Russian.) **Conversion of Oil-Fired Openhearth Furnaces to Natural Gas Heating.** V. P. Borodin, P. E. Darmanyan, I. A. Yudson and L. S. Shevandina. *Stal',* v. 17, Feb. 1957, p. 124-129.

Natural gas was proven to be cheaper than crude oil, and due to the absence of sulphur, a better grade of steel can be produced. Performance of the two firing systems compared. (W18r, 1-2, RM-m35, ST)

480-W. (Russian.) **Effect of the Hot Top Shape on the Macrostructure of Ingots.** A. K. Petrov and B. P. Okhrimovich. *Stal',* v. 17, Feb. 1957, p. 130-135.

A new hot top mold was developed with di-angular draft in its walls and a broadened base which leaves the top of the ingot mold partially exposed. The solidifying ingot hangs on this shelf. The pouring gate is easily removed because no crust is formed at the joint, and at the same time the macrostructure of the ingot is improved. 4 ref. (W19c, D9k, M28; ST, 5-9)

481-W. (Russian.) **Strain and Energy Indicators on Blooming Mill Rolls.** T. M. Golubev, L. N. Soroko, M. A. Zaikov, M. P. Kaftanov, N. A. Chelyshev, G. A. Sakharov and B. P. Zuev. *Stal',* v. 17, Feb. 1957, p. 141-146.

The loading of the motor was correlated with the strain in the principal parts of the mill. It was found that production could be increased, rolling pass time reduced and idle time minimized after strengthening certain parts of the mill. (W23a, W23n, 1-2)

482-W. (Russian.) **Cooling System of Openhearth Furnaces.** A. P. Mamet, A. V. Nikolaev and A. I. Kabanova. *Stal',* v. 17, Feb. 1957, p. 173-178.

By examining water under operating conditions and subjecting the cooling system to thermochemical tests, tentative standards were worked out for steam and water requirements. (W18r, 1-2; ST)

483-W. (Russian.) **Design of Skip Hoists of Blast Furnaces.** I. P. Prikhodko and B. A. Levshin. *Stal',* v. 17, No. 7, July 1957, p. 584-586.

Critique of the method published by Ya. F. Cheltsov and G. A. Dubrovin in *Stal',* No. 6, 1956. Detailed discussion of the design principles of the blast furnace skip hoist. 2 ref. (W12b, D1a, 1-2)

484-W. (Russian.) **140, 250 and 400-Mm. Soviet Tube Rolling Mills.** A. S. Grishkan, M. Ya. Krichevskii, G. K. Seifulin and N. B. Rozenfeld. *Stal',* v. 17, July 1957, p. 621-627.

Improved tube rolling mill characteristics and design. The mills can produce tubes with much more accurate dimensions at a great saving of metal. Thin-walled tubes can also be made using 400-mm. mill. 2 ref. (W23h, 1-2)

485-W. (Russian.) **Cooling of Openhearth Furnaces by Evaporation.** S. I. Moiseevich. *Stal',* v. 17, July 1957, p. 658-662.

General discussion of openhearth furnace cooling by evaporation of water and utilization of steam for electric power production. (W18r, W11; ST)

486-W. (German.) **Development of Ball and Roller Bearings for the Rolling Mill.** Günter Strafe. *Stahl und Eisen,* v. 77, Sept. 19, 1957, p. 1315-1329.

Characteristics of ball and rolling mill bearings; friction losses, maintenance and lubrication; application in different types of mill stands. 8 ref. (W23M, 18-21, 18-23)

Instrumentation

Laboratory and Control Equipment

99-X. **Furnace Atmosphere Analyzers.** Wayne L. Besselman. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 517-523, 525.

Discussion of dew point, infrared, hot wire and combustible analyzers, also analyzers for oxygen and specific gravity of gas. (X7j, 1-2, T2k)

100-X. **Infrared Analyzers Monitor Furnace Atmospheres for Improved Heat Treating of Steel Products.** J. L. Garrison. *Industrial Heating,* v. 24, Oct. 1957, p. 2011-2016.

Operating economy, simplified machining, and an increase in usable product are among the benefits achieved by automatic atmosphere monitoring with infrared analyzers. (X7, J2k; ST)

101-X. **Saturable Reactor Control of Electric Furnaces. Pt. 1.** R. M. Sills. *Industrial Heating,* v. 24, Oct. 1957, p. 2028-2036.

Where precise control of temperatures is needed, saturable reactors are applicable. Basic principles, construction and operation. (To be continued.) (X9s, W27j, 1-2)

102-X. (German.) **Modern Measuring and Regulator Equipments for Melting and Heat Treatment Furnaces.** A. Hohmann. *Giesserei-Praxis,* v. 75, Aug. 25, 1957, p. 354-355.

Equipment, operation; temperature regulation diagrams for gas and electric furnaces. (X9s, W18, W27, 1-2)

103-X. (Russian.) **Measurement of Temperature in Upper Part of Gas Checkers of Openhearth Regenerators in Kuznetsk Metallurgical Combine.** M. M. Epshtein. *Stal',* v. 17, No. 7, July 1957, p. 600-601.

Method eliminating contamination of thermocouple. Detailed diagram of the device. (X9, W18r, 1-2)

104-X. (German.) **Apparatus for Study of Gas-Metal Systems and Results of Measurements on the Tantalum-Oxygen System.** Erich Gebhardt and Hans-Dieter Seghezzi. *Zeitschrift für Metallkunde,* v. 48, Aug. 1957, p. 430-435.

Apparatus that permits direct and indirect heating of metal wire or band to its melting point. Results on damping and electrical resistance behavior during degassing of tantalum. Electrical resistance of tantalum increases linearly with concentration of oxygen dissolved in lattice. (X24f, P15g, 1-3; Ta)

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MAY 12-16, 1958

Southwestern Metal Exposition

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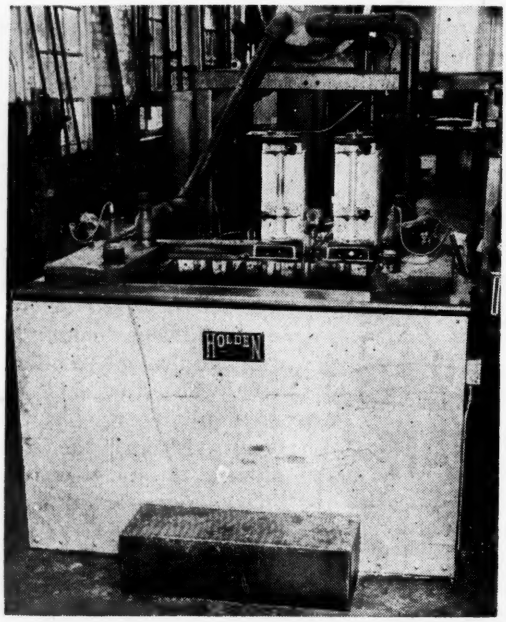
State Fair Park Is Only Two Miles from Downtown Hotels

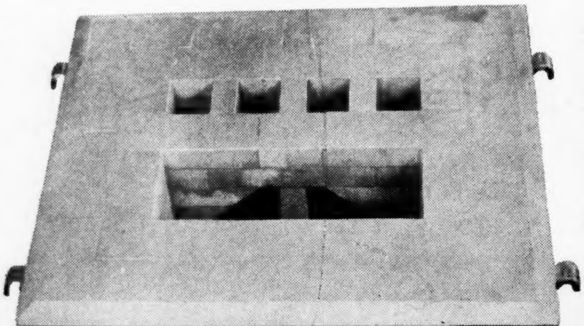
METAL SHOWS OWNED AND OPERATED BY THE AMERICAN SOCIETY FOR METALS

METHODS OF FINANCING INDUSTRIAL EQUIPMENT INSTALLATIONS



HOLDEN—TYPE 401
Gas Fired Marquenching-Austempering

HOLDEN—TYPE 701
Inner Furnace Assembly 1000° F to 2300° F



1. A Conditional Sales Contract
2. Sum of the Digits or Declining Balance Methods
3. Leasing or Renting

DIRECT COST AS FOLLOWS:

1. Conditional Sales Contract or sum of the Digits plan—down payment of 25%.
2. A 2 year Conditional Sales Contract equals a 12% interest or service charge.
3. Sum of the Digits methods for 5 years equals approximately 24% interest or service charge.

WHAT IS A LEASE?

A LEASE is a contract usually for a specified rent for a term of from 2 years to 10 years. Normal LEASE terms for buildings are usually a 3 months deposit or a 6 months deposit depending on the length of the LEASE.

LEASE TERMS—INDUSTRIAL FURNACES

(2 YEAR CONTRACT)

1. There is a 12% interest or service charge for the initial 2 year LEASE.
2. At the signature of the LEASE, 3 months rent is paid.
3. There are 21 equal LEASE payments after delivery of the equipment under the LEASE.
4. In the last 60 day period of the LEASE term, the LEASE may be extended either for 1 year or for 3 years.

LEASING AND PROFITS:

1. LEASING is a direct expense without investment.
2. Any other method used 25% initial down payment, plus service or interest charges.

THE A. F. HOLDEN COMPANY

3 F.O.B. Points for Holden Metallurgical Products

EXECUTIVE OFFICES AND PLANT
- 14341 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN

EASTERN PLANT
- 460 GRAND AVENUE, NEW HAVEN 13, CONN.

WESTERN PLANT
- 4700 EAST 48th STREET LOS ANGELES 58, CALIF.